THE IRON TRADE REVIEW

VOLUME XXVI. CLEVELAND, O. JULY 27, 1893. CHICAGO, ILL. NUMBER 30.

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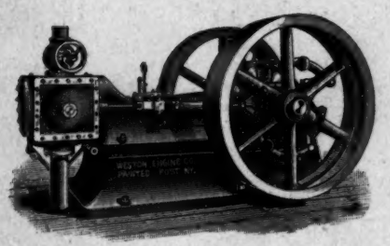

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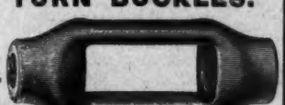

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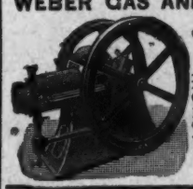

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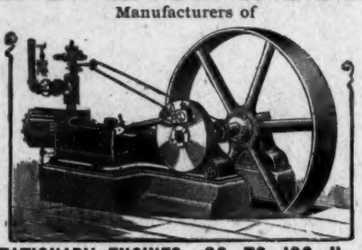

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THE IRON TRADE REVIEW

VOLUME XXVI. CLEVELAND, O. JULY 27, 1893. CHICAGO, ILL. NUMBER 30.

THE WEEK IN IRON CIRCLES.

GENERAL FEATURES

The army of unemployed iron mill workers has been lessened by several thousand the past week with the resumption at Jones & Laughlins' mills at Pittsburg, and of smaller mills here and there that have signed the scale. But there is no development that would warrant the straining of a single point by the proprietors of mills still idle, in order to get their men back at their places. The money situation, on which the iron industry, as well as every other is now waiting, has been better and worse in spots the past seven days, and several failures in iron, with further trouble among Central-Western and Northwestern banks, are an offset to reports from New York of a better feeling and a better statement from Gotham banks. The blast furnace interest is following the pace set by the iron ore mines and reducing production to conform more closely to the current demand, and a heavy curtailment of active furnace capacity will appear in the report for August 1.

THE CLEVELAND SITUATION.

There are a few inquiries for ore from furnacemen who are likely to make purchases before August has progressed very far, but it is doubtful if sales agents would care to make any transactions calling for the movement of any considerable amount of ore within the next 30 days, or until there is less difficulty about getting money to pay freights. There is no question that a furnaceman in shape to make a cash transaction, could drive a very tidy bargain in ore, just now. One or two such deals were made before the pinch of hard times became quite so painful, but furnacemen and ore producers are alike in feeling the pressure that is now on, and the ore buyer is in no better shape to take advantage of low prices for cash, than is the ore-producer to get the benefit, to any great extent, of the demoralization in lake freights. Boats have been available the past week, for Ashland and Two Harbors ore, practically at the shipper's terms, the rate vibrating between 50 and 60 cents. Marquette charters strengthened a trifle, under the special demand developed there, and from 50 cents went to 60 at the close of the week, but are again on a nominal basis. Some mines in the Marquette district, accustomed to ship by way of Escanaba, have found in the past week that with a 20-cent differential in Marquette's favor and a lake freight only five cents more than from Escanaba, there was money to be made in increasing Marquette shipments. This has resulted in running the Marquette tonnage considerably ahead of that for last year. The past week has contributed further to the list of idle miners in the Lake Superior region and on the Vermilion range, which has been the last to show the effects of the depression, there is talk of an almost complete stoppage of operations. In the Schlesinger troubles the new development of particular interest is the reorganization of the Chapin Mining Co., by which Angus Smith, John H. Tweedy, Jr., and Robt. Tweedy become directors. Arrangements were made in the same connection for giving the men a month's pay. At the Aragon and Sunday Lake mines the attachments are still in force and work is suspended. In the case of the Chapin the transition to other control comes about even more quietly than the resumption of control of the Schlesingers last year, after the Vanderbilt inter-regnum. On the Mesabi, the event of interest is the practical completion of the Mesabi & Northern extension from Stony Brook to Duluth. But there will be no great amount of ore shipped this season, from all indications. A 200,000 ton estimate is now made by conservative authorities; but all will depend upon market developments of the next 60 days. The recent acquisition of the Adams mine by a syndicate closely connected with John D. Rockefeller, and the concentration of important mining, and both rail and lake transportation interests in the same hands, is significant of the figure the Mesabi will cut in the market by another season. And if iron ore production is to undergo the same evolution as to prices that has taken place in oil, the recent developments on the Mesabi become of serious import.

Pig Iron. The market is at its lowest ebb as far as demand is concerned and the only feature worth mention is the prospect that charcoal iron will show more strength when demand resumes, owing to the almost complete cessation of production in Michigan districts. At Sharpsville some 28,000 tons of iron are to be thrown on the market by the sheriff's sales at the Douglas and two other furnaces with which Forsyth, Hyde & Co. were connected; but it is perhaps as well for such a bear influence to come now, with the rest of the trouble. On foundry iron quotations are the lowest yet made.

Finished Material. There has been a fair run of small orders in the structural market the past week, beams and plates forming the bulk of the business, on a price basis the same as for the past month. Bids are beginning to be asked on agricultural contracts and in these steel cuts a larger figure than ever. Bar iron is in light demand. There is no incentive to local mills that are idle to talk of resuming. The Union Rolling Mill is still shut down and will remain so for some time. The Cleveland Rolling Mill Co. are operating in about half their departments. The Otis Steel Co. are still running, though at reduced wages, but their blooming mill is idle. Three nut and bolt concerns in Cleveland are running five, four and three days per week, respectively. Reports from the valley indicate no change in the attitude of mill owners, all of whom are well content to save pay rolls and find no such inquiry from the trade as would suggest resumption.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

There is very little animation in the market, and sellers of all classes of iron and steel are devoting more energy to the collection of accounts than to the sale of material. Both crude and finished grades of metal are suffering from a general depression, and sales are almost nothing. It is expected by some dealers who take a hopeful view of the situation that business will pick up within a few weeks, but others say they do not look for any improvement for some time.

PIG IRON.—The amount of business done in the past week was smaller, if anything, than in the week previous, and it is hardly likely that any large sales will be made for a little while longer. The country trade is in a little better condition than is the city business, and most of the orders received have been from out of town. In the city, business has been affected to some extent by the placing on sale of the iron in the hands of the foundries that have made assignments lately. This iron has been offered at very low rates, and has been the means of shutting the regular dealers out of some little business.

BAR IRON.—The week has been very quiet, and no orders of any size have been placed. Quotations are the same as last week, but because of the scarcity of transactions, they are only nominal. Bar iron, 1.45c to 1.50c; steel, 1.60c to 1.65c.; Chicago.

RAILS AND TRACK SUPPLIES.—Very little business has been done, and there is no change in prices. Rails, $30 to $32; track bolts, 2.60c to 2.65c; spikes, 2c to 2.05c.

STRUCTURAL IRON.—There is no change in the situation, and no sales of any importance have taken place. Beams, 1.85c to 2c; angles and plates, 1.80c to 1.90c; tees, 2.15c to 2.25c.

SHEETS.—Black sheets are quiet, with only a small sale. Prices are unchanged at 2.80c to 2.85c., Chicago. Galvanized sheets have had only a small demand, and are quoted at 70 and 10 per cent. at the mills, 70 and 5 per cent. from store.

PLATES, TUBES, ETC.—Only a small inquiry is noted, with no change in quotations. Tank steel, 1.80c to 1.90c; shell steel, 2c to 2.15c; flange steel, 2.25c to 2.35c; fire box steel, 3.75c to 4c; tubes, discount of 65 to 70 per cent.

MERCHANT STEEL.—Trade is still very quiet, and the outlook is not very encouraging for the immediate future. Open-hearth spring, 2.25c to 2.30c; machinery, 2.10c to 2.25c; tire, 1.95c to 2.10c; crucible machinery, 4.75c; spring, 3.50c; tool steel, 6½c and upwards.

OLD RAILS AND WHEELS.—No business has been done in the past week, and prices are nominally the same. Old rails, $17 to $17.50; old wheels, $14.50 to $14.75; old steel rails, $11 to $14.50, according to length.

SCRAP.—Business has been very quiet, with no change in prices. No. 1 forge, $15; No. 1 mill, $11; turnings, $8; mixed steel, $9; coil steel, $13; leaf steel, $14; low tires, $13.

GENERAL MARKET RESUME.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. Outside of the adjustments of wages made by the Amalgamated Association with Jones & Laughlins and Painter & Son, both of which concerns are now running, the mill situation is the same as last reported. Trade continues very light and neither buyer nor seller shows any disposition to make contracts. Some small transactions have been closed in billets and in pig iron; the former were on a $21 basis. Bessemer pig is quoted at $13.10 and $13.25. Gray forge at $11.75 and $12, and No. 1 foundry at $13.50 and $13.75. One sale of ore in the local market is reported—3500 tons of second-grade Bessemer at $3, equivalent to five cents per unit of iron. The scrap market has almost ceased to exist, old iron rails being quoted as low as $16 and old steel rails at $12.50. Scrap of any description can be bought at practically whatever the buyer would be willing to pay.

Louisville. The outlook is not encouraging, as money continues close and the inability to discount paper makes it impossible for business to be carried on in the usual channels. There has also been a large falling off in the demand for finished work, and it is among the possibilities that the pipe shops, which are large consumers of iron, may shut down in general, and that but few of the car companies will continue to run full. There are many who believe that when a revival of business takes place the movement of prices will not be gradual, but that a sharp advance will take place. There is but little movement in car wheel iron. No general concession is made in prices of coke irons save that a few small lots seeking cash customers have been offered at 50 to 75 cents below the market.

Cincinnati. In some directions the outlook seems a little better, because a number of inquiries have been received from those who contemplate purchasing round lots, and thus taking advantage of the extremely low prices. Some important deals have been closed during the last few days. The purchases have extended over nearly the whole range of irons, including Lake Superior Charcoal, Ohio Strong Irons and Southern Cokes. Although low prices were made, it is apparent that bottom has been reached. The Lake Superior Charcoal situation is in a rather hopeful condition on account of so few furnaces being in blast. After one or two lots of iron, held by banks and others as security, have been disposed of, the field will be clear of low priced lots and future trades must be with furnaces who are not disposed to continue making iron at a loss. Production has been quite largely decreased in the South on account of the stoppage of four of the largest furnaces, owing to trouble with the coal miners. This will have quite a decided effect on the output of iron in Alabama.

Buffalo. Consumption is steadily dropping off. Each week records a lower mark in dullness of new business than the preceding. With the exception of "labor," which is still clamoring for higher wages, no one is trying to make money. All are busily engaged rowing for the shore. Prices remain about the same and weak in a way, yet few furnaces are forcing sales.

St. Louis. There is very little interest taken in new business. A few buyers have entered the market and some sales have been made at low figures owing to the ability of the purchaser to pay cash. The consumption of pig iron and coke has decreased since the first of June, but production has also fallen off because several furnaces have shut down. Dealers in iron merchandise are not buying from the manufactures, as there is little demand for their goods, and a scarcity of money makes the payment uncertain.

Philadelphia Many buyers who use Alabama iron in their mixture are holding off in regard to purchases, thinking that freight rates will be put back on the old basis so that they can secure metal at correspondingly low figures. Considerable iron is coming forward on old contracts via water, from Savannah, Richmond, Norfolk, etc.

THE IRON TRADE REVIEW

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JULY 27, 1893.

INCREASED PRODUCTION OF BESSEMER PIG.

The most significant fact about the statistics for pig iron production in the first six months of 1893, as given in another column, is the increase shown in the make of Bessemer iron. The record is the greatest yet made in any like period and its publication accents what the puddler has heard from the manufacturer in the wage conferences of the past month. Put in tabular form, with percentage computations made, the figures tell their own story as to the march of steel:

	1891.	1892.	First half 1893.
Pig Iron Production, gross tons	8,279,870	9,157,000	4,562,918
Bessemer Production, gross tons	3,888,853	4,444,041	2,374,890
Percentage Bessemer	47	48.5	52

It will be seen that while the percentage of Bessemer iron in 1892 was 1.5 per cent. greater than in the year previous, the production for the first half of the present year indicates a pe centage of 5 in advance of that for '91. The production of Bessemer in gross tons, as compared with that for the two preceding half years is shown in the following:

	First half of 1892.	Second half of 1892.	First half of 1893.
Bessemer pig iron	2,254,345	2,169,696	2,374,890

Taking the Bessemer producing districts whose high-grade ores come exclusively from the Lake Superior region, it appears that West Virginia, Illinois, Wisconsin, Minnesota and Ohio made less Bessemer pig in the first half of 1893 than in the first half of 1892, while an increased amount was made by the Shenango valley, Allegheny county, the miscellaneous coke furnaces of Western Pennsylvania and the few in the interior counties securing their ores in part from the Lake Superior region. The total falling off in the districts named was 172,016 tons from the first half of 1892, and the total increase was 200,380, making a net increase of 28,364 gross tons in the amount of pig iron from Lake Superior Bessemers, in the first half of '93, over the amount for the first half of 1892. Illinois shows the largest falling off in Bessemer—from 389,588 gross tons in the first half of '92, and 411,073 tons in the second half, to 295,383 tons in the first half of the present year. Allegheny county shows the largest increase—from 644,932 tons in the first half of 1892 and 679,169 tons in the second half, to 792,201 in the six months ending June 30, 1893.

Allowing 1⅔ tons of ore for each ton of Bessemer pig iron made in the districts supplied from Lake Superior, there were consumed about 2,800,000 tons of Lake Superior Bessemer ores in the first half of the present year. The same rate continued through the year would give a consumption of 5,600,000 tons of Lake Superior Bessemer for 1893. It is hardly necessary to state that this figure will not be reached. The second half of the year will tell quite a different story in the production of all descriptions of pig iron from that of the well-maintained production of the six months ending with June.

HOME SOLUTION OF TIN PLATE PROBLEMS.

In the line of the discussion in these columns recently, on the lasting qualities of roofing plates manufactured by coating American steel sheets, a well known manufacturer comments on the value of any opinion on the subject that might emanate from the Welsh tin plate trade. Writing to this paper, he says:

"As far as foreign manufacturers are concerned, I must confess no great amount of confidence in their opinion. It is a remarkable fact that notwithstanding Wales for many years has practically enjoyed a monopoly of tin plate manufacture, a very small fraction indeed of the output there is consumed in their own country. The writer has actually had the experience of having one of the largest of the Welsh manufacturers of terne plates, make the inquiry *as to the use to which they were put!* This, notwithstanding the fact that his investment in his plant represented probably £100,000, and that his output was very large indeed."

This incident is only confirmatory illustration of the observation repeatedly made by friends of the American tin plate industry, that its domestication was necessary, if the people of the United States were to have the benefit of any improvement in processes of manufacture, or of any attempt to adapt the product more perfectly to the uses required of it. It has been demonstrated already, that the native Bessemer ores used in American steel-making, make sheets that are preferred by the buyer, to those manufactured from foreign-made black plates. We have no doubt that the experience home tin plate manufacturers are gaining daily, in the study of processes carried on under their own eyes, will lead to the solution of questions that have long puzzled the trade, under the regime of exclusive importation. The pinhole difficulty and the short life of some roofing plates, apparently of the same quality and subjected to the same exposure, as others which endure to the satisfaction of the buyer—these problems stand some chance of being solved with manufacturer and consumer in such easy communication, that the buyer can at any time walk into the mill and inspect processes of manufacture. Certainly their solution is far more likely, than when the buyer was compelled to look to the importer, who in turn took the word of manufacturers, the latter in some instances having so little home demand for their product, that they did not know the use to which it was put. All that the American tin plate manufacturer asks is a chance.

THE TREND OF FOUNDRY PRACTICE.

While there are a good many foundrymen who expect to continue in the old way until indications thicken that the day of the chemist has fully come, there is satisfaction to those who are pushing for more scientific methods in the melting and casting of iron to know that their contention is being well supported. This comes, we take it, from a recognition that the old cut-and-try methods are not satisfactory. And it is more than a coincidence that the Foundrymen's Association at Philadelphia and the

Western Foundrymen's Association had for the theme of their July meeting the part the chemist is to take in the foundry practice of the immediate future. It is more than a coincidence, too, that while the Foundrymen's Association was discussing a proposition to secure the services of an expert who could make chemical determinations for its members on call, the Western Foundrymen's Association had before it an offer from an important technical institution to perform similar services for the foundrymen of the West.

The expense of fore-arming himself against the sudden and often inexplicable changes in the character of his castings has been the main obstacle, with the average foundryman, to the application of chemistry to his processes. The organization of foundry associations and the pro-rating of expense among the membership-seem to offer a way out on that score. Foundrymen's associations in Europe have such technical connections, and the smaller foundries secure advantages that would be entirely unavailable to them, single-handed. The action taken by the Eastern and the Western Foundrymen's Associations at their last meetings gives promise that some of the most important results of organization are to be accomplished along this line.

The chemists whose addresses to these Associations we have printed—the one in last week's issue, and the other elsewhere in this issue—assure the foundryman that he may know as to the composition of his iron and as to its shrinkage, before the fact. This is a feature of the chemist's work upon which Mr. Chute laid stress in the portion of his address at Chicago last week comparing chemical tests with physical. And if the chemist can make any grade of iron desired, barring accidents, he becomes at once an invaluable adjunct of foundry practice. What expert chemists claim in this direction need not be discounted for the disposition to glorify one's own profession, of which all trained men partake; the possibilities of foundry chemistry are already a matter of record with some establishments. But this knowledge has cost roundly. Foundrymen's associations promise to put it within the reach of small foundrymen at less than the cost of a single blunder of the method of cut-and-try.

FURNACES AT MISSOURI'S IRON MINES.

In his contribution to the official publication of the World's Fair Commission of Missouri, State Geologist Winslow calls attention to the decline in Missouri's production of iron ore, which has been noted in these columns from time to time. By a graphic representation, the output of 1892, 126,000 tons, is seen to be the smallest since 1870. The days when Iron Mountain and Pilot Knob stood for a large contribution to the country's production have gone by. From 1815 to 1849 Missouri produced 100,000 tons of iron ore; from 1850 to 1860, 310,000 tons; from 1861 to 1869, 625,000 tons. Since 1870, a total of 6,680,125 tons has been taken from Missouri iron mines, a yearly average of 290,440 tons. Since 1887, the decline has been gradual, and at the present rate of falling off, Missouri will soon land among the States producing less than 100,000 tons of iron ore per year. State Geologist Winslow gives some slight hope of betterment, but it is coupled with the condition of blast furnace investments that is not likely to be realized:

"The decline in Missouri's iron product is in sharp contrast to the increase in production of her other minerals, and calls for serious consideration. In 1880, she ranked sixth in the Union; in 1890, tenth; in 1891, thirteenth, and she now probably ranks still lower. This sudden fall is to be attributed, in large part, to the cessation of work at the Pilot Knob mine, which was practically abandoned last year. That the well-known deposits of specular ores in the State can no longer play the important part in the iron industry that they have in the past, seems unfortunately probable. If the industry is to be maintained, other sources of supply must be developed. Among the most promising fields for future activities, observations lead one to point to the limonites of the southern part of the State, which have heretofore remained practically unnoticed. That they are lower in iron contents and inferior in grade to the high-class ores used in the past, is not disputed. But that they are so much so as to be of no practical use is not the case. Their distribution, quantities and qualities have been determined by recent work of the State Geological Survey and a report just distributed deals at length with these ores. That they will bear shipment does not seem probable, but t eir development will probably best be by the establishment of furnaces and the production of p'g within the mining region itself."

There is little question that the future activity of not a few Lake Superior properties that have heretofore been steady shippers, is likewise conditioned on the erection of blast furnaces close to the mines.

PIG IRON PRODUCTION FOR THE HALF YEAR.

In the current issue of the *Bulletin* of the American Iron and Steel Association are given complete statistics of pig iron production in the United States in the first six months of 1893 and complete figures as to unsold stocks of pig iron on hand June 30.

The total production of pig iron in the United States in the first half of 1893 was 4,562,918 gross tons, against 4,387,317 tons in the second half of 1892, an increase of 175,601 tons. The production in the first half of 1892 was, however, 4,769,683 tons. Compared with the first half of 1892, the production of the first half of 1893 shows a decrease of 206,765 tons. The figures by States are as follows:

States.	Blast Furnaces.				Production. Gross tons of 2,240 lbs. (Includes spiegeleisen.)		
	In Blast Dec. 31, '92	June 30 1893.			First half of 1892.	Second half of 1892.	First half of 1893.
		In	Out	Total			
Massachusetts	2	2	2	4	4,178	3,768	4,119
Connecticut	5	4	4	8	9,856	7,251	7,335
New York	9	6	27	33	163,838	146,557	140,776
New Jersey	6	4	11	15	44,282	43,693	39,598
Pennsylvania	106	103	103	206	2,216,832	1,976,973	2,225,962
Maryland	3	4	7	11	49,981	49,150	89,729
Virginia	14	9	25	34	164,086	178,761	152,155
N. Carolina	1	1	1	2	1 853	1,055	2,445
Georgia	1	2	4	6	3,330	6,620	16,509
Alabama	28	23	29	52	479,131	436,165	447,948
Texas	.....	1	3	4	6,403	2,210	5,838
West Virginia	3	1	3	4	80,238	74,555	66,398
Kentucky	3	3	6	9	32,649	23,899	37,281
Tennessee	10	11	9	20	157,214	142,867	128,539
Ohio	34	33	32	65	651,335	570,578	594,643
Indiana	1	1	1	2	5,431	2,269	5,313
Illinois	8	5	15	20	477,961	471,489	335,771
Michigan	8	5	17	22	91,190	93,231	81,907
Wisconsin	6	4	6	10	72,156	102,805	107,855
Minnesota	.....	.....	1	1	13,218	853	10,373
Missouri	2	2	3	5	30,634	26,386	22,329
Colorado	2	2	1	3	10,448	21,993	37,119
Oregon	1	.....	1	1	3,439	4,189	2,976
Washington	.....	.....	1	1	.....	.....	.....
Total	253	226	312	538	4,769,683	4,387,317	4,562,918

It will be noticed that Pennsylvania largely increased her production, and that there was a large decrease in Illinois.

The production of Bessemer pig iron in the first half of 1893 was the largest half-yearly production in our history, amounting to 2,374,890 gross tons, against 2,189,696 tons in the second half of 1892, and 2,254,345 tons in the first half.

The production of spiegeleisen and ferromanganese in the first half of 1893, which is included in our statistics of total

pig iron production, was only 47,976 gross tons, against 91,757 tons in the second half of 1892, and 87,374 tons in the first half.

The number of furnaces in blast on June 30, 1893, was 226, against 253 on December 31, 1892, and 256 on June 30, 1892. The number out of blast on June 30, 1893, was 312.

The stocks of pig iron which were unsold in the hands of the makers or their agents on June 30, 1893, and which were not intended to be used by the manufacturers, amounted to 549,141 gross tons, in which figures are included 46,510 tons of stock held in the yards of the American Pig Iron Storage Warrant Co., and which was under the control of the makers, the part in these yards not under their control amounting to 29,690 gross tons, chiefly Alabama iron. This added to the 549,141 tons above mentioned makes a total of 578,831 tons on the market June 30. In the same way adding 29,500 tons which were in warrant yards December 31, 1892, and not under the control of the makers, the total on the market December 31, 1892, was 535,616 tons. There was thus a total increase in pig iron stocks on the market in the first six months of this year of 43,215 tons, over 30,000 tons of the accumulation being in coke iron. The figures as to unsold stocks by States appear in the following:

States.	Gross tons of 2,240 lbs.			
	June 30, 1892.	Sept. 30, 1892.	Dec. 31, 1892.	June 30, 1893.
New England	16,210	14,936	14,093	12,222
New York	61,469	52,717	45,627	44,866
New Jersey	30,919	30,626	23,083	11,368
Pennsylvania	218,804	170,876	113,115	151,858
Maryland	2,666	3,061	3,404	2,178
Va., N. C., Ga. and Texas	81,452	72,814	58,893	59,421
Alabama	67,966	55,982	68 3 8	73,188
West Virginia	7,000	6,150	5,230	
Kentucky	5 303	2,278	6,321	5,580
Tennessee	35,853	32,914	25,818	25,562
Ohio	89,396	79,091	62,376	67,454
Mich., Indiana and Minn	53 535	40,204	30,263	45,891
Illinois and Wisconsin	38,146	25,868	16,353	14,770
Missouri and Colorado	25,697	27,665	31,322	32,845
Pacific States	3 530	2,200	1,900	1,938
Total	737,946	617,382	506,116	549,141

Of the stocks noted above, 244,144 tons was coke, against 213,615 December 31; 120,461 tons was anthracite, against 119,015 December 31, and 184,536 tons charcoal, against 173,486 tons December 31.

On The Editorial Table.

"Standard Steel Construction" is the title under which Jones & Laughlins, Pittsburg and Chicago, have put out a valuable manual for architects, engineers and contractors. It is bound in leather, with flap, and is of the convenient handbook size with which architects and others are familiar. The illustrations of various shapes are clear and the notations of dimensions and weights give some idea of the range of size and strength which the firm's products in this line take. Following these come scores of pages of tables, giving safe loads in tons for various structural materials, with dimensions and the various increments of load corresponding to additions to the weight of material. Under the head of "General Notes on Floors and Fire Proofing," interesting information is given, with illustrations. Special attention is directed to the "Larimer column," for which the manufacturers claim superiority in strength, simplicity of construction, method of connecting, etc.

"Engineering Works of Cleveland, O.," is the title of a hand-book of convenient pocket size, bound in flexible cloth, issued by the Civil Engineers' Club of Cleveland, as its contribution to the engineering literature the Columbian Exposition has called forth. The book, as its sub title says, is a visitors' dictionary to the engineering works and industries of Cleveland, and while compression into small space has been the constant aim of the editor, Mr. W. H. Searles, he has given a very complete summation of the interesting public works of the Forest City and of the iron and steel plants, engineering industries, car wheel works, shipbuilding works and dry docks, wire and nail works, nut and bolt works, malleable iron, foundry and other kindred interests. A number of illustrations add value to the text.

THE IRON FAILURES OF THE WEEK.

Charles W. Depauw and the New Albany Rail Mill Co., of New Albany, Ind., made an assignment, Saturday, July 22. The cause was the assignment of the Premier Steel Works in Indianapolis several months ago, of which Mr. Depauw held 6,450 shares. Mr. Depauw's endorsements for the Premier Steel Works were $500,000, and for the New Albany Rail Mills, $300,000. He says if he can realize on his assets, he can pay out two for one. He adds that the assignment does not in any way affect the interests of his brother, N. T. Depauw, who is vice-president of the New Albany Rail Mill Co. The capacity of the mills is 35,000 tons a year. It was one of the first mills to sign the Amalgamated scale.

The ramifications of Forsythe, Hyde & Co.'s failure of a few weeks ago, due to their connection with various furnace companies, are more extensive than at first appeared. Executions and foreign attachments aggregating $330,408, were levied last week against the Douglas Furnace Co., operating the Pierce, Kelley & Co. furnace at Sharpsville, Pa. These were on behalf of Price McKinney, receiver for Corrigan, Ives & Co., $178,908.85; the Croton Lime Co., $1,500; the Mill Exchange Bank, $25,000; Wisconsin Marine Fire Insurance Bank, $125,000. The executions cover ore and other stock. At Youngstown, suit was begun against the Douglas Furnace Co. by the First National Bank of Youngstown, on a note for $1,210. Several companies were garnisheed, including Tod, Stambaugh & Co., Morgan Engineering Co., and Ohio Iron Co. The Hostetter-Connellsville Coke Co. has also sued the Douglas Furnace Co. for $5,135.37 on a promissory note. Cleveland firms are garnisheed. The engineering and contracting firm of Wilkie, Bothwell & Co., of Pittsburg, have a claim of $6,300 against Forsythe, Hyde & Co., the latter having accepted drafts in their favor to that amount, made by the York Iron Co., of Minneapolis, for whom Wilkie, Bothwell & Co. had been erecting a plant at West Superior. In connection with the failure of the Commercial National Bank, at Milwaukee, Friday, it is stated that the immediate cause was the failure of the Douglas Furnace Co., of Sharpsville. The bank held $130,000 in storage warrants on pig iron at Sharpsville. This iron was attached by Corrigan, Ives & Co.'s receiver, as stated above, and the Furnace Company confessed judgment. The bank's Attorney said that if the warrants were genuine, the bank would eventually recover the pig iron, but long litigation would be involved. He added that the deal with the Furnace Company was made through the Schlesingers. A Milwaukee dispatch says, that a quantity of ore and coal at the yards of the Minerva furnace, of which Forsythe, Hyde & Co. were lessees, was attached on a $25,000 claim by the Chapin Mining Co., but later the attachment was released.

At Belvidere, N. J., the Oxford Iron & Nail Co. has closed its rolling mills and iron mines, pending a settlement of its affairs by a receiver. The pumps have been removed from the mines, and 350 men are thrown out. The liabilities are estimated at $225,000; assets $150,000.

The embarrassed Lansing (Mich.) Iron & Engine Works report total liabilities of $413,632, and assets of $301,240. O. M Barnes, who holds a chattel mortgage on the plant, offers to pay one-third of the claims, and provide for the rest by bonds or otherwise.

The extensive machinery manufacturing concern of Bradley & Co., Syracuse, N. Y., went into a receiver's hands Monday. The plant is valued at $500,000. The liabilities are put at $350,000.

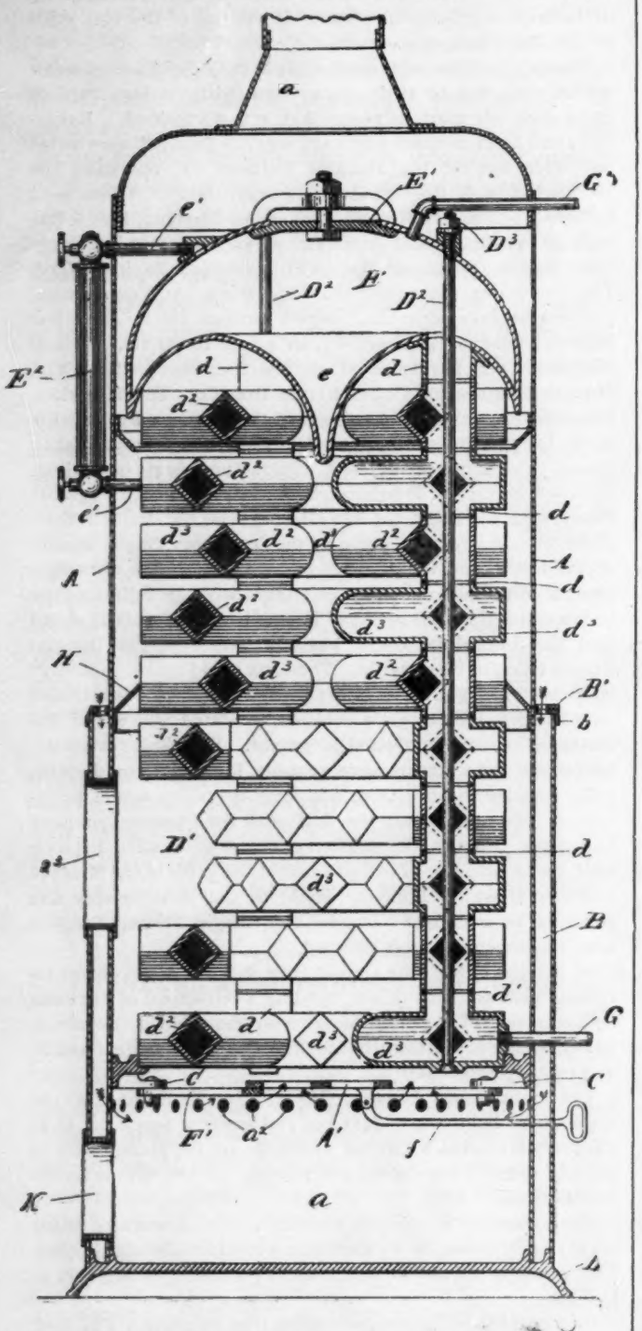
Pankhurst & Wilkinson, extensive iron merchants, Chicago, confessed judgment for $87,175. They made an assignment later.

Lippincott's Magazine for August has "In the Midst of Alarms," by Robert Barr for its complete novel, and in the series of Lippincott's Notable Stories is "Jane's Holiday," by Valerie Hays Berry. In "Men of the Day," M. Crofton presents brief sketches of Sir J. E. Millars, Sir Arthur Sullivan, Gen. Diaz, and Phil. D. Armour.

JULIAN KENNEDY has been chosen consulting engineer, to prepare plans and specifications for the new water works system Allegheny City is to build.

THE SMITH VERTICAL BOILER.

Increased evaporation for any given quantity of fuel and economy in construction are the two claims made by Geo. Y. Smith, of Minneapolis, Minn., for the vertical boiler he has recently invented. A view is given in the accompanying illustration, in vertical section from right to left, some parts being shown in elevation. Besides its adaptation to steam boiler uses, the invention may also be used with slight changes, as an air heater or a hot water heater. In the cut, A represents the shell or casing, provided at its bottom with an ash-pan space *a*, and at its top with an outlet flue a^1, for the products of combustion. B is an outside jacket surrounding the lower part of the casing and spaced therefrom and connected therewith by suitable flanges bb^1, of which the upper member b^1 is provided with air passages controlled by an ordinary circular register plate B^1. The shell A is provided below the grate with air passages a^2 into the ash-pan space. This construction and relation of the shell A and jacket B gives a means of heating the air which is used for supporting the combustion before it strikes the fuel.



C is an annular flange, secured inside the shell A directly above the ash-pan space, and constituting the seat for supporting a series of heating chambers DD^1, all of which are in the form of hollow castings, arranged in a vertical series in communication with each other by joint flanges *d* and securely held together by rods D^2 and nuts D^3, engaging with the screw threader upper ends of the rods. E is a steam dome, and it and the castings DD^1 are provided with three joint flanges *d*, equally spaced apart and forming, when the castings and dome are in position, continuous passages through which extend the clamping rods D^2, which serves to secure a rigid structure.

The intermediate castings D^1 are of the same construction as the castings D, with the exception that they are cut away at a point coincident with the door a^3 in the shell A for the admission of fuel, and with the further exception that the inside radial extensions d^3 are made shorter than on the castings D, so as to give more room for the fuel. The lower casting D co-operates with a sliding grate-center F, located thereunder, and sliding on fixed bars F^1, to form the grate for supporting the fuel. G is the inflow pipe and G^1 the outflow pipe, which can be made of any desirable size, so as to permit the use of the apparatus as a hot air furnace or hot water heater.

At a point just above the fire-pot members of the castings, an annular flange H is interposed between the casing A and one of the castings D, to prevent the direct upward passage of the burning gases and force the same into the central spaces of the castings, the arrangement being such that the gases will be more or less focalized, rendering the combustion more complete. H^1 is a similar deflecting flange near the steam dome. All parts of the hollow chambers DD^1 are rectangular in cross section, arranged with one diagonal of the same in the vertical plane. This arrangement gives a large series of dividing and deflecting surfaces, by which the ascending column of burning gases is made to inwrap all portions of the castings, rendering them very efficient as heating chambers.

The operation of the boiler would be obviously this: Water being supplied to the proper level in the series of castings and the fire started in the fuel chamber, the burning gases will envelop all parts of the series of castings surrounding the fuel, and be deflected in their ascent, by the flange H to the center of the casting directly above the fire-pot members, at which point the combustion will be intensified; and thence the burning gases will be thrown outward, and the direct ascending columns will strike the lower part of the steam dome and be directed outward and downward to the clearance spaces, thence upward over the top of the dome to the outlet flue. With this construction and arrangement of the heat medium chambers or castings DD^1, all portions of the heat from the burning gases will be rendered effective.

One-half interest in this patent has been assigned to Mr. Fred G. Atkinson, manager of the Columbia Construction & Machine Co., of Minneapolis, which in another column makes a special announcement concerning the Smith boiler.

EVANS & ROBERTSON, of Cincinnati, whose office is in the Chamber of Commerce Building, and warerooms at 61 East Front street, are factors and jobbers in steel and iron, and sales agents for Painter's brands of hoop iron, black and galvanized. They make a specialty also of steel hoops for the cooperage trade and superior hoop keepers, of several sizes and shapes for barrels, casks and kegs. These are made of the best steel, well pointed and with good heads, and are very durable. They handle brass and copper washers used on barrels, and are dealers in Norway rivets. Mr. Chas. W. Evans, of this firm, has had many years' experience in the manufacture of iron and steel. Mr. Wm. F. Robertson, the other member of the firm, has also had considerable experience in iron and steel. These gentlemen, through their push and enterprise, have built up a large trade, covering a wide field, among recent orders being one from Cuba for several lines of goods, which will no doubt lead to others.

CHAUNCEY M. DEPEW talks of the financial situation as follows: "My conclusions are that the businesss of the country is on an unusually sound financial basis, and there is everything in the present appearance of our crops and other sources of national wealth to show that our prosperity is based on good foundations. The repeal of the silver purchase clause will release money here and bring from money abroad; so it will do indefinitely more, it will permit the use of the credits which are now so fearfully curtailed and which constitute 95 per cent. of the currency of the country."

THE KUNZER SMOKE PREVENTER.

The demands of commerce require the constant use of large quantities of bituminous coal; the important demands of public health and cleanliness require the entire suppression of those products of combustion which, in the form of smoke and noxious gas, are usually permitted to escape from the stack. To meet this latter demand numerous inventions have been made. A serious drawback, heretofore, to the extensive employment of most of the meritorious devices has been the comparatively high cost of their adoption, or the inability to apply them to the old forms of construction. Both of these objections, it is claimed, are now obviated by the improvement offered under the name of the Kunzer smoke preventer. This device is adapted to either locomotive or stationary steam boilers. In its essential features it is an application of the well-known principle of the steam jet, but so arranged in combination with an intake of hot and cold air as to produce a perfect combustion of the fuel, and the complete consumption of all gases given out. Its mechanism is simple, and its operation easily understood, while the cold air pipe is so arranged as to almost entirely do away with the unpleasant sound which usually accompanies the admission of air when drawn in by a steam jet. The double air pipe is controlled by a rocking lever pivoted to the front of the boiler, which opens or closes the air intakes, and by this arrangement either hot or cold air may be supplied to the furnace in accordance with the varying conditions of the fire as the process of combustion progresses. The steam pipe through which the volume of steam is conducted to mix with the air supply in promoting combustion, terminates in a number of curved injector tubes, the upper horizontal ends of which are inserted through the double walls of the boiler front below the furnace door, and stop short with the surface of the inner wall, and open at a point above the line of the grate bars. The lower vertical ends of the pipes are inserted in T's, which are joined by a number of nipples forming a continuous connection, and the hot and cold air pipes are similarly connected, whereby the air is conducted into each of the injector pipes. The device is easily applied to any style of boiler, and works equally well at high or low pressure.

The chief merits claimed for this invention are simplicity, durability and efficiency. It is constructed on scientific principles, and it is said to accomplish the object for which it was designed—it prevents smoke. It has, however, another important merit—it is an economizer of fuel. Its action being to produce perfect combustion, it reduces every combustible element in the coal, leaving as a residuum of the furnace nothing but ashes, and furnishing to the boilers all of the caloric in the fuel. Slack coal and screenings may be used as fuel with practically as good results both at the steam gauge and the stack as better brands of fuel. For further particulars, address Kunzer Smoke Preventer Co., Suite 122, 115 Dearborn street, Chicago, Ill.

VIEWS AND INTERVIEWS.

Mr. E. A. Wheeler, of Sharon, Pa., manager of the Wheeler Furnace Co., and well posted as to valley furnace practice and conditions, says that he does not look for any improvement in pig iron until stocks on hand are materially decreased. How soon this would be could not be told, but it might be months hence. The stoppage of many of the mills has not helped the situation. Mr. Wheeler also denies the report attributed to him, that the Northern furnaces could no longer compete with the Southern pig iron industry. "We possess many advantages," said Mr. Wheeler, "that exist nowhere else, and will be in the market as long as iron is sold. It is true that at the present selling rate there is no money in iron; in fact, if we could make ten cents a ton on our output, the West Middlesex furnaces would be in operation today. We will simply have to wait for an advance."

* * *

An officer of the Cleveland Rolling Mill Co. makes this statement about operations at the company's mills, which shut down July 1 and have been resuming in part, within the past 10 days: "We have not made a reduction in wages, and no notice about wages has been posted at the mills. Our works are not being operated to their full capacity, but the plate mill is running, the angle and channel iron mill is going, the steel works are in operation, and part of the wire mill is working. If wages are generally reduced, we will be compelled to reduce also. We can not operate and pay higher wages than are paid elsewhere. Our workmen have shown a disposition to accept any reduction that may be necessary in order to keep the mills running. They are fair-minded and conservative and comprehend the situation."

* * *

The popular idea as to the amount of royalties which the inventor of the Harvey process will realize has gone far astray. By the contract the amount of royalty to be paid Mr. Harvey for the right to decarbonize armor plates by his method of treatment is fixed at ½ cent. per pound. The total amount of armor contracted for by the Navy Department for the new ships is about 19,000 tons. Less than half of this armor will be Harveyized. Even if 10,000 tons should be so treated, the inventor would receive only $100,000—a very neat little sum, to be sure, but nothing like what the general public has been led to believe he will receive. The invention may of course prove more valuable through its adoption by some of the foreign powers. It is understood that Commander Folger is now abroad on this mission, but foreign armor-plate makers are trying to get a process of their own, and with some degree of success, notably in Russia.

THE WORLD'S FAIR AND MACHINE TOOLS.

Prof. John E. Sweet, writing of things that have impressed him in connection with the exhibits at Machinery Hall, World's Fair, says of one department of the machine tool exhibit:

"The revolution in machine tools since the Centennial has been in the large advance in the use of milling cutters, and in putting cast-iron as well as brains in the machines. I can readily recall the time when gun-making machinery was sent to England from the Eastern States, and, later, that the English claimed to have improved upon it. My Yankee associate laughed and said, 'Yes, the only mortal thing they have done is to put in more cast iron and make them clumsy.' That's exactly what every one of our tool buliders have been doing for the last 16 years, which is more to our credit than sneering at the foreign product. The success or failure in the use of milling cutters depends on the rigidity of the machine and arbor, the secure method in which the work is held, and, what is often overlooked, the absolutely rigid manner in which the work is fed to its cutter. Whether the milling cutter keeps sharp or gets dull is in proportion to the above conditions. Our leading tool builders seem to have grown up to this conviction, as shown by comparing the machines of a few years ago with these exhibits at Chicago. And, too, they have made or are making another stride ahead of the rest of the world—in feeding with the direction of the cut instead of against it, which is, of course, right if a machine has no lost motion, though a surprise to everybody to learn that the cutter will keep sharp just as long cutting over cast iron scale as cutting under it.

"Isn't it a wonder that builders can sell these machines with such a departure from common practice, and yet cannot sell a lathe unless it is built on the regulation pattern?"

Personal.

Mr. Richard O. Jones has opened an office in the Cuyahoga Building, Cleveland, and will devote himself to mechanical engineering work. He has had a large experience in mining machinery, having been connected with the Vulcan Iron Works, of Wilkesbarre, Pa., and is thoroughly posted on the installation and employment of the various equipments for iron and coal mining.

Mr. H. P. Lillibridge, formerly of the firm of Corrigan, Ives & Co., has been a Cleveland visitor within the past week.

Mr. F. E. Bachman, formerly of the Salem (Va.) Furnace Co., is now superintendent of the Buffalo Furnace Co.'s plant.

Henry Wick, J. G. Butler, Jr., M. C. Wick, J. L. Botsford, E. L. Ford, E. L. Brown, L. E. Cochran and James Parmalee are the directors elected by the Ohio Steel Co. at its meeting in Youngstown, O., last week. The directors elected Henry Wick, president; J. G. Butler, Jr., vice president; M. C. Wick, treasurer. The company has over 400 men at work in its plant and expects to be producing steel by January 1, 1894.

AMONG THE IRON MINES.

Mesabi Range:—

Several new mines on the Mesabi are opening for shipping, notably the Hale, Berringer, Mesabi Mountain and Commodore. The Hale loaded its first ore last week, Tuesday, when 10 cars were filled in seven hours. The ore is shoveled into shallow boxes direct from the body, raised by overhead conveyors and carried to chutes over the cars. It is claimed that after the machinery is working well, 600 tons can be mined and loaded every day by 30 men, day and night. The Berringer, one 40-acre tract of the Biwabik, has begun loading with a steam shovel. At the workings of the Biwabik Ore Co., 2,100 tons were mined and loaded on cars by one steam shovel in 10 hours. The Mesabi Mountain begins mining and loading by shovel this week. The Commodore's first cargo went over the ore docks last week.

At the Mountain Iron, in one day last week 20 cars were loaded, averaging 26 tons to the car, in 10 hours. The ore was mined with steam shovel direct from the ore body. It is averaging very heavy. Of 40 cars in one train, the average was 63,000 lbs. per car, though the cubical contents per car are supposed to be 50,000 lbs.

An analysis of samples from a cargo of Biwabik No. 1, loaded from the Superior docks this week, showed 64.55 in iron, 3.31 in silica, .035 phosphorus and 6.13 moisture.

In the reorganization of the Adams Iron Co., after the acquisition of 51-100ths of the stock by the Merritt-Wetmore interest, on a basis of $800,000 for the property, Lon Merritt was elected president; D. T. Adams, vice-president; C. W. Wetmore, R. C. Wetmore, Lon Merritt and P. L. Kimberly directors.

A Duluth dispatch says that rail connection between the new docks there and the Mesabi mines was completed July 22, and that 100 pockets in the dock arefinished.

Vermilion Range:—

Following another reduction in wages last week, the Minnesota Iron Co. announces a suspension of operations in shafts Nos. 1 and 3, throwing out 100 men. President Bacon says he is being urged by the directory to discontinue everything except shipments and may yet have to take this course. At the Chandler, operations have been discontinued at all shafts except No. 4. President Bacon is thus quoted as to sales: "We sold of Minnesota and Chandler ore in January, 440,000 tons. This is a small quantity, and further, I confidently believe that at the present time not a ton of ore could be sold at what it costs to mine and lay down at the shipping port—in our case at Two Harbors."

Menominee Range:—

The Peru Iron Mining Co. has announced a 10 per cent. reduction in wages, to take effect Aug 1. Shipments will be curtailed materially.

Gladstone shipments are now at the rate of 15,000 tons a week. Last year's record, 115,000 tons, has already been exceeded.

The employes at the Aragon mine, one of the Schlesinger properties, have quit work on account of non-payment of wages. There are about 40,000 tons of ore on stock-pile and the indebtedness for labor is $45,000. There is talk of the property reverting to the former control, of which Angus Smith is the head, and a reorganization, as in the case of the Chapin, is among the probabilities. An attachment on behalf of the unpaid miners was levied upon the iron in stock-pile Friday. The ore is valued at $97,000 and labor claims are about half that amount. Pumps are kept going, but 400 men are idle.

At the Hamilton-Ludington mines, the Norway *Current* says, the water is practically out. In the Ludington, the water is now being kept down to a point 10 or 15 feet below the 10th level, while at the Hamilton it is kept at the 1,325 foot level. Since reaching this level in Hamilton No. 2, it is possible to know how fast the mine makes water. At first, this was 1,100 gallons a minute; then it decreased to 926 gallons, and the management believe that when the mine has had time to drain through the upper levels, the flow will not exceed 800 gallons a minute. A total of 87,017,954 gallons was hoisted in the bails. Now that it has been demonstrated that the water can be taken out at a cost not exceeding $5,000, and that the rate of inflow is not beyond the limit of economical handling, it is believed that the mines will be allowed to fill again until a better iron market appears.

Marquette Range:—

Twenty-five out of the 35 men at work at the Platt mine have been laid off.

Last week showed the heaviest shipping record for the season out of Marquette.

The Lake Superior's working force is 800 men after the recent reductions; the Winthrop employs 325 men; the Lake Angeline 750 men; the Salisbury 200 men, and the Cleveland-Cliffs 200 besides the Salisbury force. At the mines in and around Ishpeming there are 2,500 men still at work.

Gogebic Range:—

Ashland shipments in the week ending July 15 were 62,883, next to the largest single week's record this season. The total up to that date was 543,841 tons. Seventeen mines have shipped ore this season. The Wisconsin Central shipments have been 205,000, of which but a small amount was outside of the Colby properties.

In General:—

The Lake Superior iron mines are not the only ones feeling the depression. A Plattsburg, N. Y., dispatch says that the Chateaugay Ore & Iron Co. has closed down its mines at Lyon Mountain and that the Crown Point Iron Co.'s mines at Crown Point have suspended operations. An Eastern market report adds: "The canceling of orders by customers has led to the closing down of magnetite mines in New York and New Jersey, and it is understood that Lake Champlain ores have been offered at exceptionally low prices."

Iron Scale Developments.

Nothing has developed in regard to iron and steel mill wages the past week, beyond the signature of several more mills to scale, with a guaranty of the prices finally agreed upon in the conference, and the starting up of the American Iron Works of Jones & Laughlin In connection with the resumption of work at this plant on Monday, comes the announcement of the disbanding of the lodge of the Finishers' Union connected with the works, and the return of its 90 members to their places, under the scale arranged by the Amalgamated Association. President Carey is said to be the only member of the Finishers' Union in the Jones and Laughlins mill who did not return to work. He resigned because his union was not recognized. The Finishers' lodge at the Oliver Bros.' mill is also reported to be on the verge of dissolution. This condition of things disposes of the report that the 1,000 puddlers at Youngstown are talking of leaving the Amalgamated Association, and going over to the Finishers.

The scale signatures of the week include those of the Tudor Iron Works Co., East St. Louis; American Tin Plate Co., Elwood, Ind.; Cambridge Iron & Steel Co., Cambridge, O.; Irondale Steel & Iron Co., Anderson, Ind.; Tyler Tube Works Co., Washington, Pa.; Sharon Rolling Mill Co., Sharon, Pa. Thirty-two firms have signed in all.

THROUGH H. N. Green, general agent, of Philadelphia, a number of specialties are presented to the trade—some of them of special interest to foundry and machine shop proprietors and others to the general run of users of power. The Philadelphia corundum wheels, manufactured by the Philadelphia Emery & Corundum Wheel Co., have been on the market for the past two years and quite an extensive trade has been built up in all parts of the country. The Maddox cotton and wire belting, another of Mr. Green's specialties, is manufactured from cable steel wire and cotton, woven solidly together. Strength, durability and freedom from stretching and slipping are the chief claims made for it. Mineralized rubber belting and hose, and patent fluted belting and the Huntington emery wheel dresser are sold through the same agency. Their merits are fully stated in another column and descriptive matter which will be sent on application. Address H. N Green, Moore's Windsor Hotel, 1219-29 Filbert st., Philadelphia.

MACHINE SHOP AND FOUNDRY.

WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, July 19, 1893, at 225 Dearborn St., Chicago, Ill Mr. A. T. Whiting was elected temporary chairman. Among those present were the following:

A. M. Thompson, Link-Belt Machinery Co., Chicago.
H. O. Chute, Chicago.
J. P. Gilbert, The Sargent Co., Chicago.
E. L Billingslen, Rogers, Brown & Merwin, Chicago.
Dr. N. B. Rising, Berkeley, Cal.
Geo. W. Cope, *Iron Age*, Chicago.
Chas. S. Burt, Cramer & Burt, Chicago.
John A. Penton, *Foundry*, Detroit.
T. A. Wigham, Greiner Economical Cupola Co., Chicago.
E. W. Cooke, Armour Institute, Chicago.
David Van Alstine, The Sargent Co., Chicago.
S. T. Johnston, Chicago.
A. L. Ide, A. L. Ide & Son, Springfield, Ill.
Geo H. Ellis, Wm. Deering & Co., Chicago.
H. L. Hotchkiss, Wm. Deering & Co., Chicago.
A. L. Teetor, Teetor Molding Machine Co., Indianapolis, Ind.
J. H. Warder, M. E., Chicago.
A. T. Whiting, Detroit Foundry Equipment Co., Chicago.
B. M. Gardner, *Iron Trade Review*, Chicago.

The minutes of the last meeting were approved. The Treasurer's report was read and accepted.

REPORT ON CHEMICAL TESTS.

The following report was offered by the committee appointed by the chair to investigate the offer made by the Armour Institute:

Your committee appointed to investigate the offer of the Armour Institute to do the chemical and physical testing of the Association, have to report that they visited the Institute and investigated their facilities for doing the work. At present they have no apparatus, but say that they will put in whatever is necessary to do the work in a satisfactory manner, but they cannot present any figures as to the cost of doing the work until they know about how much work there is to be done. After a decision is reached by the Association as to whether they want to go into any arrangements with a chemist, and an approximate idea is given them as to what amount of work there will be to do, the Armour Institute will submit a proposition.

T. A. WIGHAM,
B. M. GARDNER,
A. T. WHITING,
Committee.

The report was accepted.

Mr. Geo. M. Sargent, of Sargent & Co., Chicago, and Mr. Chas. Allis, of the E. P. Allis Co., Milwaukee, were nominated for the presidency of the Association to fill the vacancy made by the resignation of Mr. C. A. Plamondon, of Chicago. The Secretary was instructed to notify the members of the Association of the nominations made, to be voted upon at the next regular meeting.

NEW MEMBERS.

The following members were received into the Association:

Brown Bros. Manufacturing Co., Chicago, Ill.
Rogers, Brown & Merwin, Chicago, Ill.
Charles Brunner, Peru, Ill.
Challenge Wind Mill & Feed Mill Co., Batavia, Ill.
L. L. Graves, Streator, Ill.
A. L. Ide & Son, Springfield, Ill.
David Van Alstine, Sargent Co., Chicago, Ill.
Jas. R. Gilbert, Sargent Co., Chicago, Ill.
The J. D. Smith Foundry Supply Co., Cincinnati, O.

The following paper was read by Mr. H. O. Chute, of Chicago:

The Chemist as a Factor in Foundry Practice.

BY H. O. CHUTE.

Since this paper was asked for by the executive committee, several articles on the same subject have appeared in the technical press, and the able address given before the Eastern association by Mr. Wm. C. Henderson entitled "The Value of the Chemist's Service as Applied to Foundry Practice," which you have all doubtless read, treats the subject so thoroughly and so well that the writer of the present article decided to confine himself to a few remarks on the possible methods by which the chemist should be utilized in the foundry, feeling that all are now alive to his value and importance. To do this, a short description of the chemist's methods of work in a Bessemer steel works will be given, as illustrating a parallel manufacture and one in which the services of chemistry have been brought to the highest perfection.

With the advent of the Bessemer converter the chemist became a necessity, as its processes could never have been brought to this present perfection without his aid.

Previous to this time all branches of the metallurgy of iron were supposed to be mysterious secrets, known only to a few who had inherited in some way this knowledge from their ancestors, and who by long experience had a kind of intuition as to the hidden causes of success or failure. If failure attended one effort, the only escape was by guessing the cause and experimenting to find some way to avoid the difficulty. This condition led to extreme conservatism, and the safest plan was to stick by a material and method which was known by experience to give satisfactory results. Expansion, development and improvement were prevented by the impossibility of predicting beforehand the result of a costly undertaking.

Now, however, the causes of the seemingly mysterious differences in iron and steel have been traced to the different elements contained therein, and which on account of their small quantity had been previously overlooked. This knowledge has enabled the manufacture of steel to be brought to a strictly scientific basis, and knowing exactly what is wanted, iron is bought on chemical specifications, and immediately on receipt of material it is tested by the chemist. This test shows exactly its quality, and the user then settles for it and knows without a doubt exactly its suitability for the required purpose; no "trial carloads" are necessary, and disputes as to quality are impossible.

When the metal is blown in the converter, another change takes place, and its amount and extent are determined by more chemical tests. The steel being a final product, is tested mechanically by hammering, bending, etc., and any fault revealed immediately requires investigation by the chemist to determine its cause. It will thus be seen how closely the chemist is associated with every operation, how every action is watched and studied at the converter's mouth, how all the causes of success and failure are discovered by analyzing all the materials, and all the products all the way through, and analyzing the effect of all the elements on the reactions which take place in its manufacture.

WHAT CHEMISTRY DOES FOR THE STEEL MAKER.

The possibility of determining beforehand and without costly experiment the suitability of material for certain purposes by knowing its chemical composition, has enabled the manufacturer of steel to select from the widest possible range of raw materials the most advantageous, has enabled him to to secure uniform results and has shown the way to economies which have tended to cheapen the product, enabling him to supplant largely the manufacture of wrought iron and even to threaten the field of the iron casting.

The chemist at the steel works soon necessitated a chemical supervision of the blast furnace, if the pig iron was to be always of the desired composition. This practice soon showed great advantage over the previous imperfect methods, and while furnaces making Bessemer pig iron have a chemist from necessity many of the furnaces running on foundry iron pay strict attention to the composition of their ores, flues, fuels, etc., because of the superior results gained thereby, and it may be said to-day that the furnaces are ready to furnish anything desired by the foundry.

But why, asks the foundryman, if this is the case, do not the furnaces supply us with an iron exactly suited to our uses and thus avoid any necessity on our part for taking up this troublesome question. To answer this, and to throw some light on the causes of variations in iron from different localities, it will be necessary to examine into the conditions which surround the blast furnaces.

VARYING BLAST FURNACE CONDITIONS.

To the furnace accessible to the Lake Superior region an unlimited assortment of the richest ores are always available.

But these are hauled a long distance and by the time they are laid down at the furnace are expensive.

The advantages of a rich ore lies in the less freight per ton of iron made, the less amount of fuel used, and the increased capacity of the furnace. Its disadvantages lie in the greater cost per unit of iron, and the probability that it will produce an iron lacking in silicon, and hence one that will not carry much scrap and will not correct chill or shrinkage. The other elements of lake ores, such as manganese, sulphur and phosphorus, are usually not in sufficient quantity to affect the pig iron materially.

The furnaces near the Connellsville coke have a cheap fuel, relatively free from sulphur, and some local silicious ores and cinder. By mixing these with Lake ores are produced the irons known as Ohio soft irons and American Scotch. These are well known as being soft and strong irons, which is due to their being free from excessive amounts of sulphur, phosphorus and manganese, and having rather large quantities of silicon.

The furnaces of the South have to deal with an ore which is silicious and carries relatively large quantities of phosphorus, and a coke which usually carries more sulphur than the Connellsville. Here, having cheap ores, fluxes and fuel, and cheap labor, they are enabled to run on a lean ore, and by using more coke and flux, and keeping the furnace hot, produce an iron high in silicon and known as a soft iron and a scrap carrier, but on account of its percentage of phosphorus, not very strong.

The furnaces producing "local coke foundry," having high freight rates to pay on ore and fuel, use a rich ore, and with low fuel consumption and a great capacity, make an iron strong on account of its freedom from sulphur and phosphorus, but on account of its relatively low silicon not noted as a scrap carrier.

Lake Superior charcoal being made from a pure fuel and from especially selected ores, gives an iron particularly free from phosphorus, sulphur and silicon, and on account of its purity, being very strong, and its tendency to chill gives it great value in particular lines.

It will thus be seen that there are economic reasons for the production of different kinds of iron in different localities, and that to use them to the best advantage an intelligent mixing will be required. But the characteristics of iron from different localities are not always constant, differing not only with particular furnaces, but by the particular conditions at the furnaces at the time of making.

DIVORCE OF FURNACE AND FOUNDRY.

The impossibility of always making an iron suitable for a particular purpose and of knowing what kind of iron would run from the furnace until it was cooled and examined, led to the divorce of the furnace from the foundry business, the two businesses being formerly combined, as is shown by the fact that the superintendent of the furnace is yet called the founder.

To correct a fault of any particular iron, the particular iron must be singled out, the cause of its failure determined from lack or excess of a particular element, and this remedied by the addition of another iron having a relative excess or deficiency of the same element.

To experiment with the cupola mix till the cause is determined is both tedious and expensive, for with six or more irons containing six varying proportions of six elements, the number of combinations which may be made before the right one is found offers a very inviting field for the calculations of the mathematician, but their contemplation very often wearies the founder.

The analysis of the casting here immediately locates the cause of the trouble, and knowledge of the composition of the irons in the mix allows the offender to be singled out, and points the remedy at the same time.

HOW AN ASSOCIATION CAN BE OF HELP.

Heretofore the majority of founders have considered that the extent of their business did not warrant their employing the services of a chemist, but the present Association offers a great opportunity for mutual aid in this direction by their having a laboratory for their special use, where there would always be the facilities for their individual work, where they could always consult with a specialist on the problems which are always arising, and where work of general value and interest to the trade could always be carried on, and the knowledge distributed through the society.

Some of the larger foundries have already availed themselves of the services of a laboratory, and the results in all cases have been most satisfactory, although for business reasons there would naturally be no great disposition among them to herald its advantages, but some of the notable advances of late, both in improvement of quality and cheapening of product, are directly traceable to this cause.

POINTS AS TO PHYSICAL TESTS.

To avail himself of the advantages of chemistry, it will be necessary for each founder to determine, first, just what physical qualities are required for his special line of work. This will involve physical tests, and on this subject let the following be quoted: "It must be obvious to all that the actual service to which an article is put when occupying the position for which it was made is the best conceivable test, and as the chemist's knowledge has, in the first place, been derived from and his sole aim is, in the last place, to met this test, it might be said that he is wholly independent of tests other than chemical ones. The very utmost which can be hoped from such tests is to determine whether a certain lot of material is good or bad." It may be also remarked in this connection that the founder knows pretty well what he wants in this respect, the main problem being the best and cheapest method of getting it.

The writer wishes to throw no discredit on any physical tests, recognizing their value from a scientific standpoint and in connection with chemical analysis. But of what use is an elaborate system of physical tests alone which reveal nothing for future guidance? If the product is thus tested, it reveals nothing as to where the error lies in the mixture; and if the different irons are thus treated, besides the error caused by dissimilar treatment, from what would be received in the cupola, there must always be made the false assumption that the physical qualities of an iron would always be transferred to the mixture, the fallacy of which is easily shown by melting a ferro-silicon and white iron together, both being hard and brittle, and obtaining a very soft casting as the result.

As to what chemical compositions will give the best results, the requisites are so varied, depending on the uses to which an article is to be put, that probably the easiest way is to select some of the best and some of the worst specimens, and by analysis determine what elements are required and what to avoid. With these factors determined once for all, there remains the constant attention that is necessary to always know what elements, and their proportions, are in stock, and the ever varying factors of the composition of fuel, the effect of treatment, and others which will constantly arise.

Another thing essential is for the founder and the chemist to get better acquainted and understand each other better. The founder is liable to regard the chemist as an upstart who tries to teach him his business. The chemist is apt to forget that he deals with but one of the numerous factors which are necessary in the production of good castings, and that without the practical knowledge of the founder as to the handling of the iron, the running of the cupola and the other things necessary in the foundry, the knowledge of chemistry is of no avail. But in this day of specialists, it may be conceded that more than one man is necessary to make the best castings.

THE ADVANTAGES.

Finally comes the question, "Will it pay?" The certainty of getting just what is wanted, or the ability to use anything which is offered cheap without costly experiment, must count for something; and the freedom from attachment to some brands or names, which is now paid for at 25 cents to $1 per ton, will be somewhat of a compensation.

The lessening of the amount of spoiled castings might also be enumerated. And finally, the broadening field for the iron casting, through the improvement in quality and uniformity of products, which field seems at present to be narrowing, will be of such vast advantage to the trade that the wonder will be expressed that the advantages were not embraced sooner.

N. B. Rising, of Berkeley, Cal., being called upon by the chair, said: "I came a stranger and a listener rather than as a speaker. We are just waking up to this subject in California,

and I was directed to bring back what I could to my State of the feeling of the practical foundrymen elsewhere. I prefer to listen. We have done nothing as yet in this line in California, but we are getting ready to do something."

Mr. J. H. Warder was called upon by Chairman Whiting. He said: "I can fully endorse the paper that we have had, as it is a matter that has given me a great deal of trouble in the past. I go to a foundryman who is making castings that are not satisfactory and I ask him what he is using. Well, he is using various kinds of pig and some scrap. Well, what is in that scrap? Some heavy castings, etc. He says he uses his judgment, but that is not telling us what the iron is. Judgment is very well in its way, but I think we are getting the right start when we know what we are working with in the beginning. I remember what an acquaintance of mine said in regard to photography: 'Well, you have got to guess a good deal.' Judgment is only an educated guess. I hope the Association will make good arrangements with the Armour Institute. An Institute can do better than all the foundrymen."

Mr. Geo. H. Ellis: "Another factor in the foundry line to which a chemist would be of importance is malleable manufacture. There are no malleable men present to-night that do not know that the best malleables are made from the best of iron, and chemical work in the foundry is of great importance in that by careful examination of the pigs and a little figuring a mixture can be ma de which will come out of the oven good iron. I think in this line of business the chemist is a great factor."

Mr. A. M. Thompson: "I am like the others. I came this evening to listen, and I had not any preparation made. I was only notified this evening of the meeting. I listened to Mr. Warder's remarks with interest. We do not do just as he speaks of. We go by percentage and have an idea of the chemical relations of the irons. It has been satisfactory so far; but we would like to get all the knowledge we can on the subject. We do not think we know it all."

Mr. J. P. Gilbert: "In our business we started a laboratory when we were running on steel castings. It is very essential in steel works. In the iron foundry I think there is a great deal to be gained by chemical work, although we go mostly by the fracture. With our machinery castings it is the rule to cast a bar two inches square, and then, before we had a testing machine, take it out and try it with a sledge. If it showed up rather tough and had a good soft look, we considered it satisfactory. Chemical work in the iron foundry could be done very reasonably. When we had a chemist it kept him busy to look after the two steel furnaces. We have been thinking that if business picked up we would have a chemist and hoped to give the results of some of our investigations to the Western Foundrymen's Association."

Mr. T. A. Wigham: "I would like to say that the paper of Mr. Chute has given us quite a surprise. The proceedings of this meeting are published and I propose that we continue the discussion at the next meeting, as it is of great value. We could ask Mr. Chute some questions at the next meeting. I believe the majority of the gentlemen that have spoken have been as much surprised as myself. The first business of the next meeting should be the discussion of this paper. If the foundry requires a chemist, that is all right. He is wanted ahead of the scrap pile."

It was decided that the discussion of the paper should go over as unfinished business until the next meeting.

CO-OPERATIVE CHEMICAL TESTS.

Mr. Whiting: "Before submitting the question of arranging for chemical tests, to the members of the Association, I should like to say that we have with us to-night Prof. Cook, of the Armour Institute. It would give us pleasure to listen to what he has to say on the subject."

Prof. Cook: "Mr. Chairman, I thank you for the honor and am glad to be here to-night. I will state that on June 6 I dictated a letter to Pres. Plamondon, of this Association, asking for information in regard to the work you intended to do. The Armour Institute intends equipping the laboratory for its own business in metallurgical work, chemical work and physical work. If we can make arrangements with your Association to undertake the work, whereby we would know we were not investing a great deal of money and have no returns, we would be perfectly willing to talk with you so as to know the kind of work you wished done and the amount of work. At the next meeting, if satisfactory, we would be willing to submit a paper to your Association. I might state here in regard to physical work, in the testing of metals, it is not of so much use without chemical work, and the chemical work is not of use without the phyiscal, and they are of no use without metallurgical work. The three are combined together and with the three you can form results that are advantageous. I am not here to speak for Dr. Haupt or Prof. Foy. Dr. Haupt has charge of the metallurgical department, and Prof. Foy of the chemical department. I have a letter here from Dr. Haupt which I will read:

CHICAGO, JULY 18, '93.

B. M. Gardner, Esq., Secy., 1419 Monadnock Bldg.

DEAR SIR: Your circular letter of July 14th at hand and I will say had hoped to be with you, but am prevented. However, I will say to you, through the medium of paper and ink, that the metallurgical department of Armour Institute is ready to aid foundrymen in all investigations of a scientific nature they may require. We intend, when you make the demand on us for the information, to erect furnaces for the smelting of ore and alloys, and giving you in an experimental way the results of the fusion of different alloys and metals and to determine for you the best practical and economical methods for eliminating phosphorus, sulphur and other objectionable elements from the products. We will make analyses of ores, coals, slags and fluxes and give you practical results (I enclose a few circulars that will explain themselves). In fine, we propose to make this department a bureau of practical information and consultation for the foundrymen of this region. I should be pleased at any time to meet and talk with your members."

Respectfully yours, H. HAUPT, JR.

Mr. J. A. Penton: "Mr. Chairman, os much has been said that it does not leave any room for anything else. The paper read by Mr. Chute was the finest thing of the kind I have ever seen or heard. There were more practical things in it for the foundryman than I have ever seen in so small a space. There is too little known of this matter among foundrymen. There is not one man in twenty or fifty that makes the iron, that pays sufficient attention to the matter, to say what composes the various kinds of pig iron. If he does not get the same result the next day that he had to-day, he blames the molder. Regarding the matter of the Armour Institute, it appears to me that our Association being but an infant as yet, we hardly know what we want to do, and the Institute is hardly in a position to make a proposition yet. I think we have every reason to appreciate the kind offer made by the Armour Institute. There are such a small number of foundrymen that can have a chemist. There is not one foundryman in twenty that could have the services of a chemist."

PROPOSITIONS FROM CHEMISTS.

Mr. Gardner: "In this connection I will read some letters I have received from other chemists:"

CHICAGO, JULY 11, 1893.

Mr. B. M. Gardner, Sec'y, Western Foundrymen's Association.

DEAR SIR: Complying with your verbal request to state on what terms I would maintain a laboratory for the use of the Foundry Association, I will state that if twenty-five or more members will contribute five dollars each per month, I will open an office in Chicago where I can always be consulted, where tests of general interest to the trade can always be made, and each member contributing can always be entitled to have five determinations made each month for his own use. Yours truly,

H. O. CHUTE.

UNIVERSITY OF WISCONSIN,
MADISON, WIS., JULY 18, 1893.

Mr. B. M. Gardner, Sec'y, Western Foundrymen's Association.

DEAR SIR: I am informed by Hon. John A. Johnson, president of the Fuller & Johnson Manfg. Co., in this city, that the Western Foundrymen's Association is likely to make some provision for having proper tests of iron, and perhaps other metals, made in connection with some institution of learning. The purpose of my writing is to say that the University of Wisconsin is remarkably well equipped for conducting such tests. Our College of Mechanics and Engineering has eleven professors, who have been selected with great care, and who, I believe, are fully equipped for any work that may come to their hands. We have such an equipment of testing machines as will enable us to do all that is needed. The chemical laboratory has a good metallurgical equipment, and the whole is to be very considerably enlarged during the present summer. Hoping that these facilities may be taken into consideration before any final decision is made, I am, very respectfully yours, C. K. ADAMS, Prest.

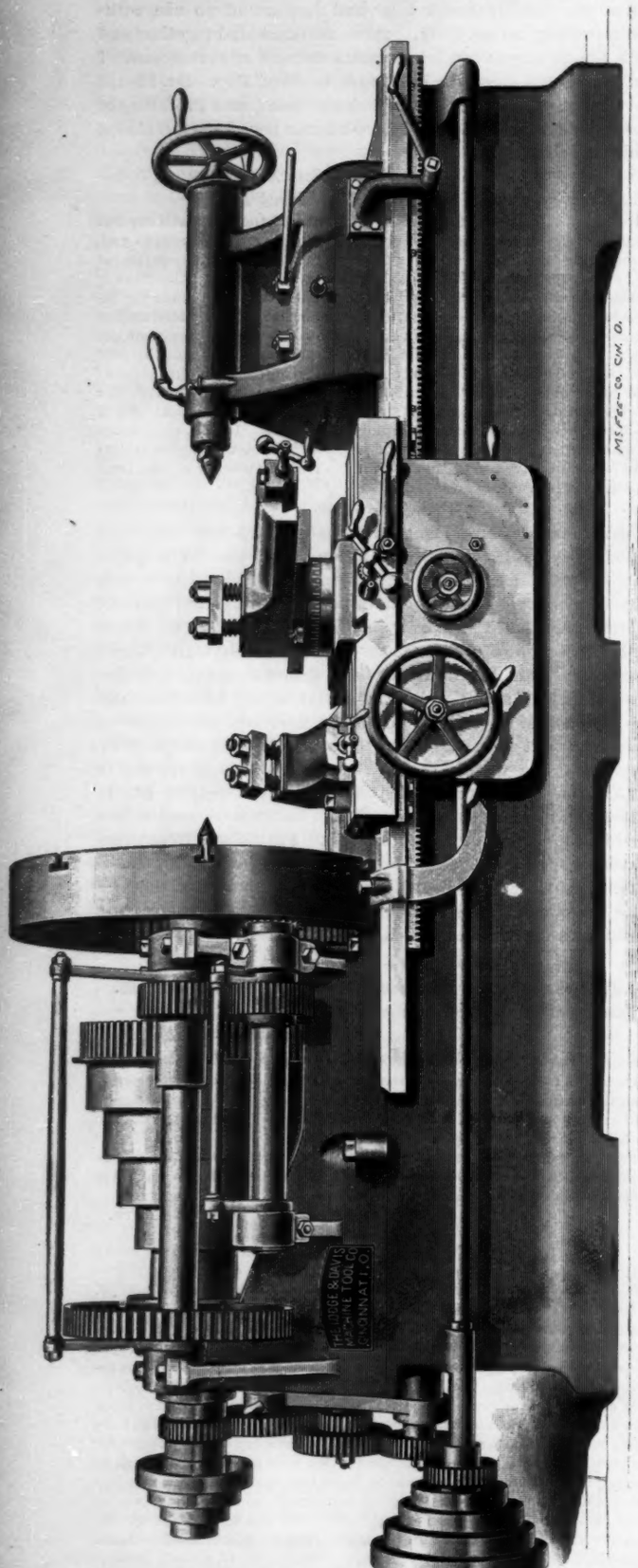
H. L. HOLLIS & CO.,
Analytical Chemists and Mining Engineers.
CHICAGO, JULY 19, 1893.

Mr. B. M. Gardner, Secy., Western Foundrymen's Association, 1419 Monadnock Block, City.

DEAR SIR: We notice in *The Iron Trade Review* that your Association is taking up the matter of tests and analyses in connection with foundry

practice and is considering the advisability of making arrangements by which this work can be done for the different members of the Association.

We would call your attention to the facilities which we have for doing this work and would be glad to confer with your Association in regard to doing this work for you. We have completely equipped laboratories in the Rookery Bldg., of Chicago, and the Perry-Payne Bldg., of Cleveland,



THIRTY-SIX INCH TRIPLE GEARED LATHE.

provided with all the appliances for making rapid and accurate analyses of pig iron and all foundry supplies. We are also prepared to make physical tests through Messrs. Robt. W. Hunt & Co., who have a complete equipment and competent engineers for this work. In fact, with our equipment and force of chemists and by telephone communication, our laboratories could practically take the place of those at the works for plants that could be reached by telephone from Chicago or Cleveland. We could be consulted in all matters regarding the use of these analyses and tests for practical purposes and we bring to this work a long and varied practical experience. Following please find our regular charges for pig iron analyses:

Silicon	$4.00
Sulphur	4.00
Phosphorus	4.00
Manganese	4.00
Graphitic Carbon	4.00
Combined Carbon	4.00

For physical tests where no preparation of the sample is required:

(1) Tensile strain, plain test	$1.00
(2) Tensile strain, with limit of elasticity and ultimate load,	1.50
(3) Tensile strain, with limit of elasticity, elongation and per cent. of reduction, full test	2.00
(4) Transverse or compression strain, plain test	1.50

Machine work that is required on specimens which are not sent prepared ready for test will be charged for at cost.

Capacity of machine used, 200,000 pounds. Reports can be made on work submitted to us within one or two days after receipt of sample and we would further add that all chemical determinations are made in duplicate on different weights of material.

In case the Association requires not less than fifty physical tests and fifty determinations per month, we will make a reduction of 25 per cent. to the Association from the prices given above. We should be very glad indeed to have your Association inspect our facilities for doing this work. Yours very truly, H. L. HOLLIS & Co.

It was moved and carried that the propositions and letters be submitted to the Executive Committee.

Mr. Penton: "I have something to submit to the members of this Association in the way of castings from Yale & Towne Co., of Stamford, Conn. Two of them are finished by the Bower-Barff process and two as they came from the sand. The two that are finished are to be left with the Association. One pattern is sixty years old. The other pattern came from Glasgow forty years ago."

The secretary was instructed to acknowledge the receipt of the castings.

A vote of thanks in the name of the Association was extended to Mr. Chute for his excellent paper.

The meeting then adjourned until the third Wednesday in August.

B. M. GARDNER, Secy.,
1419 Monadnock Block, Chicago, Ill.

THIRTY-SIX-INCH TRIPLE GEARED LATHE.

The accompanying illustration is of a recently designed 36-inch triple geared engine lathe, built by the Lodge & Davis Machine Tool Co., of Cincinnati. The bed of this lathe is of great depth and massiveness. The head-stock is unusually long, and bolted to the bed at three points in its length. The ace-plate is keyed to the main spindle, and is driven by a pinion gearing into an internal cut gear on the back of face-plate. The cone has five steps for 4-inch belt; largest diameter cone, 21-inches; smallest diameter, 8 inches. Fifteen changes of speed are provided for.

The carriage is 50 inches long, is very heavy, and has large wearing surfaces, both on the bed and on the cross-slide; the apron is secured to it in such a manner as to lend additional stiffness. The carriage is gibbed both front and back. The foot-stock has long bearings on the ways, is unusually heavy, and is moved along the shears by means of the usual rack pinion and crank handle. It is held by four clamping bolts, and has set-over for tapers.

The reverse for feeds is placed in the apron, where it is at all times convenient to the hand of the operator. The compound rest is graduated, and has power feed in all directions. The automatic stop can be so arranged that any number of pieces can be turned or bored up to a given point without marking or further attention after stop is once set. The feed rod can be driven either by belt or gears. The spindles are of steel, the live spindle having ground bearings running in composition boxes, which are readily adjustable for wear. The lathe swings 38 inches over the ways, and 26½ inches over the carriage.

MANUFACTURERS could not better serve their own interests than by aiding their employes to visit and study the fair. The Kilbourne & Jacobs Mfg. Co., of Columbus, O., has set an example in this respect that is worthy of imitation. This company employs about 200 men, and it has been its custom to give its employs an annual picnic, but this year the picnic was abandoned for an excursion to the World's Fair, arranged by the company. A special train took the members of the firm, their employes and their families from Columbus to Chicago, where four days were spent in sightseeing.—[Manufacturers' Record.

THE WORLD'S FAIR POWER PLANT.

Description of Engines at the Columbian Exposition.

The greatest power plant ever constructed is at the World's Fair. Fifty-two boilers of various makes, recently described fully in *The Iron Trade Review*, furnish steam to 69 engines of 32 different makes, aggregating 26,500 horse power, indicated, and 35,000 horse power, maximum.

While the plant at the Fair has such a diversity of engines that it can hardly be called a model plant, it is representative, and that is as it should be. Every type of engine is shown, and nearly every prominent American engine builder is represented by one or more engines in operation, and there are as well several engines in the plant from foreign countries.

E. P. ALLIS CO.

Because of its size the 2,000 horse power engine, the exhibit of the Edward P. Allis Co., of Milwaukee, attracts the most attention. This engine is rated at 2,000 h. p., at the maximum of economy, but is capable of developing 3,000 horse power. Its total weight is 650,000 pounds. It is quadruple expansion, with cylinders 26 and 40 and 60 and 70 by 72 inches. It makes 60 revolutions a minute. The fly-wheel is 30 feet in diameter by 76 inches face, and weighs 80 tons. The shaft is 21 inches in diameter, and 17 feet in length. The engine drives two 10,000-light dynamos. The valve gear is the Reynolds-Corliss long stroke cut-off, capable of cutting off at 11-12 stroke. Under the present load and steam pressure the engine runs on an evaporation of 11.8 pounds of water per horse power per hour. The cylinders are steam-jacketed. The receivers are placed below the floor, between the cylinders, and are furnished with reheating tubes. The air pump is 36x16, and is driven by a Corliss cylinder. It exhausts into the second receiver. On top of the big engine, by way of contrast, stands a complete model of a Corliss engine, 2x4, with a 14-inch wheel, making 100 revolutions a minute. It runs a miniature dynamo and some small lights.

The E. P. Allis Co. have also on exhibition a 500 horse power cross compound condensing Reynolds-Corliss engine, direct coupled to a railway generator. This engine is 19 and 36x48 inches, and is run at a speed of 90 revolutions a minute. The cylinders are steam-jacketed. The frame is of wrought iron, making it possible to use an open cross-head. The same firm exhibits also a new thing in engine construction, as an experiment. It is a vertical tandem compound of 240 horse power, 16 and 26x16, running 175 revolutions. Its peculiarity lies in the fact that the engine has but one piston, and the piston itself is the only separation between the cylinders. One-half the stroke is made by the high pressure cylinder, and the return stroke by the low pressure. The high pressure cylinder, which is the lower one, is a ring whose area is equal to that of a cylinder 16 inches in diameter. The piston extends into this ring, the upper part forming the piston for the low pressure cylinder. The steam admitted into the high pressure cylinder forces the piston up to the end of the stroke, and is then exhausted into a receiver, and from there into the low pressure cylinder, to complete the revolution. The exhaust valves are of the regular Corliss type. The induction or admission valves are rotary cylinders worked by a ratchet. Steam is admitted through the center of these valves which are hollow, and have five ports. The ratchet pulls the valve one-fifth around at each stroke. The cut-off is fixed at the most economical point. The connecting-rod is attached directly to the piston, the engine being without a piston-rod.

WESTINGHOUSE, CHURCH, KERR & CO.

The exhibit of Westinghouse, Church, Kerr & Co., of Pittsburg, comprises fourteen engines of various kinds. There are six of 1,000 horse-power each, of an entirely new type, the ones in Machinery Hall being the first ones built. They are vertical tandem compound condensing, double-acting, direct coupled by flexible couplings to the dynamos. The cylinders are 21½ and 37x22, and the engines make 210 revolutions a minute. The weight of each engine is 70 tons. The high pressure cylinder has a piston valve controlled by the governor, while the low pressure cylinder has a slide valve worked by an eccentric inside the crank chamber. The valve gear weighs about 1,000 pounds, and on account of the speed, the pressure due to the inertia of the reciprocating parts increasing with the square of the revolutions, the strain on the pins aggregates over two tons. It thus becomes necessary to neutralize this pressure otherwise than by direct resistance. This is accomplished by a newly designed inertia balance. This is an air cushion whose varying resisting pressure at the different points of the stroke exactly balances the inertia strain, so it is claimed, thus leaving the governor free from work except for controlling impulses of the vibrating gear. The engine is solidly built. The shaft is 13 inches in diameter, the crank pin is 10x12, and the main bearings 14x36.

By the same company there are exhibited three 125 h. p. direct coupled, two 330 h. p. direct belted, and one 330 h. p. direct coupled, single acting compound condensing engines. It has also two 125 h. p. single acting simple engines. In the compound engines the cranks are so placed that the steam from the high pressure cylinder is exhausted directly into the low pressure cylinder without going through a receiver. They have piston valves placed across the tops of the cylinders at right angles. The valve stem is connected with the eccentric rod by a rock shaft. All this class of engines have shaft governors in an enclosed space, filled with oil.

FRASER & CHALMERS.

On the same platform with the big engine stands the one exhibited by Fraser & Chalmers, of Chicago, a triple expansion engine of 1,000 horse power. This has two low pressure cylinders 34 inches in diameter, intermediate 34 inches, and high pressure 20 inches by 60-inch stroke. It makes 64½ revolutions. The fly-wheel is 28 feet in diameter by 69 inches face, and weighs 49 tons. The engine runs a 10,000-light dynamo The valve gear is of the Corliss type. All four cylinders are regulated from one governor, and the engine cannot be reversed. The high pressure cylinder cuts off at one-third, the intermediate at one-half, and the low pressure at five-eighths stroke. The guaranteed duty of the engine is the development of one horse power on the evaporation of 14 pounds of water per hour. It is mounted on the usual Corliss guerdon frame, in sections, with round slides.

[To be continued.]

Death of Prof. Werner Kummel at Chicago.

Werner Kummel, one of the best known engineers of Germany, died at the Oaklane Hotel in Chicago, Wednesday, July 19, aged 69 years. Prof. Kummel had been in this country about three weeks, and in Chicago one week. He came to visit the Fair and to deliver two lectures before the congress of engineers. During the warm weather of a week ago he was overcome by the heat and never recovered. Prof. Kummel was the leading water works engineer of Germany and was an intimate friend of Prof Koch. Since he had been in the United States he had been in Boston, New York, and Philadelphia, where he was consulted by a number of American engineers interested in water and gas engineering. The funeral took place in Chicago last Saturday, and was under the charge of the Associated Engineering Societies of the United States and Canada.

ESCANABA, Mich., at a public meeting, secured enough pledges for lots to indicate that the plan to start the Escanaba Metal Manufacturing Co. will succeed. A number of local capitalists have secured control of 160 acres of land. They have set off 10 acres to the Escanaba Metal Manufacturing Co., which, in consideration of a $35,000 bonus, will put up two large brick buildings, to employ 50 men, and within a year 150 men, and at the end of two years and for three years thereafter, 300 men. The bonus is to be raised by the sale of lots to citizens, the syndicate offering 250 lots at $200 each. If a sufficient number of lots is disposed of, the contract will be entered into.

IT has been decided by the executive committee appointed at the recent St. Paul Reciprocity Convention to issue a call for the next International Reciprocity Convention at Duluth, October 10. A meeting of the Duluth and Superior people will be held to begin preparations for the convention. It is intended to secure the presence of all the leaders of the movement both in Canada and this country, and to recommend some practical steps for establishing reciprocal trade relations between Canada and the United States.

INDUSTRIAL SUMMARY.

New Enterprises:—

The following recent incorporations, specially reported for *The Iron Trade Review*, are of interest to the iron and machinery trades:

Sioux City, Iowa.—Sioux City Brass Works; capital, $25,000; for operating a foundry and machine shop; incorporators: H. D. Woodruff, S. G. Nilson, Sioux City, Ia. Address letters care of H. D. Woodruff, Sioux City, Ia.

Chicago, Ill.—The Self-feeding Grate Co.; capital, $25,000; to manufacture and sell Shaw self-feeding grate; incorporators: Chas. Beck, Joseph M. Shaw, Louis Beck. Address letters care of Fred W. Hersey, 714 Tacoma Bldg., Chicago, Ill.

Rockford, Ill.—Mechanics Foundry Co.; capital, $15,000; to manufacture all kinds of castings and foundry work; incorporators: Levin Faust, G. W. Swan, Benj. Anderson, Olof F. Johnson. Address letters care of F. G. Hogland, Rockford, Ill.

Sioux City, Iowa.—Sioux City Electrical Supply Co.; capital, $100,000; to manufacture and deal in electrical machinery and supplies; incorporators: H. D. Woodruff, S. G. Nilson, Sioux City, Ia. Address letters care of H. D. Woodruff, Sioux City, Ia.

Chicago, Ill.—The Jackson Wind-Mill & Motor Mfg. Co.; capital, $100,000; for manufacturing windmills and motors; incorporators: Wm. T. Payne, Geo. H. Helberg, Wm. Gray. Address letters care of Wm. T. Payne, 44-70 La Salle st., Chicago, Ill.

Little Valley, N.Y.—Cattaraugus Cutlery Co.; capital, $100,000; for the manufacture and sale of cutlery; incorporators: Jno. B. F. Champlin, A. E. Darrow, Elmer E. Kelley, Little Valley, N. Y. Address letters care of Jno. B. F. Champlin, Little Valley, N. Y.

Chicago, Ill.—The Barnum Mfg. Co.; capital, $60,000; to manufacture and sell gas fittings, fixtures, appliances, etc.; incorporators: F. H. Campbell, Wm. S. Newberger, Henry Meiselbar. Address letters care of H. Meiselbar, 100 Washington street, Chicago, Ill.

Brooklyn, N. Y.—Krantz Metal Bobbin Company; capital, $6,000; for the manufacture and sale of bobbins, etc.; incorporators: Samuel O'Connor, Andrew N. Nielson, John Flint, all of 360 Pearl Street, Brooklyn, N. Y. Address letters care of Andrew N. Nielson, 360 Pearl st., Brooklyn, N. Y.

New York City, N. Y.—Boas-King Knitting Machine Co. of the United States; capital, $150,000; for the manufacture and sale of machinery; incorporators: Maurice Lowry, Emile H. Roth, both of N. Y. City, N. Y., Daniel Goldochmidt, Cornwall, N. Y. Address letters care of Daniel Goldochmidt, Cornwall, N. Y.

Chicago, Ill.—W. C. Ritchie & Company; capital, $100,000; to manufacture and sell paper boxes, cans, and paper box machinery, deal in strawboard etc.; incorporators: Wm. E. Ritchie, Fred C. Swett, Aldert Smedes. Address letters care of W. C. Ritchie & Co., Green and Van Buren sts., Chicago, Ill.

Chicago, Ill.—The Self-Acting Air Brake & Car Coupler Company; capital, $10,000,000; to manufacture and sell car couplers and automatic air brake couplers for railroad cars; incorporators: Victor K. Koerner, T. D. Hurley, Louis A. Roy. Address letters care of Hurley & Koerner, 115 Dearborn st., Chicago, Ill.

East St. Louis, Ill.—The Coneto Mining Co.; capital, $200,000; to work and operate mining property, mills, etc., for reduction of ores, and manufacturing pursuits in connection therewith; incorporators: J. E. Smith, Frank N. Johnson, Jacob Straus. Address letters care of Sale and Sale, 525 Commercial Bldg., St. Louis, Mo.

Clarksburg, W. Va.—The Butters & Bartlett Folding Crate Co.; capital, $10,000 min., $200,000 max.; for manufacturing, selling, renting, leasing, etc., folding coops and crates; selling, using, etc., any patent improvement, etc.; or machinery for manufacturing same; incorporators: J. W. Butters, Craigmoor, W. Va.; Flora M. Butters, Granville Bartlett, Clarksburg, W. Va. Address letters care of J. Philip Clifford, Clarksburg, W. Va.

New York, N. Y.—The Johnston Embossing Machine Co. (incorporated in W. Va.); capital, $500 min., $500,000 max.; for manufacturing and selling machines for embossing paper and conducting a general stationery and printing business; incorporators: J. Yardley Johnston, Montclair, N. J.; Wm. P. Roome, New York, N. Y.; F. A. Thomson, 280 Broadway, New York City, N. Y. Address letters care of F. A. Thomson, 280 Broadway, New York City, N. Y.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

The Supervising Architect, Washington, D. C., will receive sealed proposals until 2 P. M., Aug. 10, for all the labor and materials required for the erection and completion of new boiler house, new boiler plant, etc., for the U. S. Bureau of Engraving and Printing, at Washington.

Additions, Enlargements, Removals, Etc.:—

The new plant of the Westinghouse Electric & Mfg. Co., at Brinton Station, near Pittsburg, will be the largest of the kind in the world and will employ 4,500 to 5,000 men. It will consist of three main brick buildings and several smaller ones. The machine shop will be 750 feet in length by 312 wide, and will have three floors. The foundry and casting shop will be 725x300 feet with two stories. The third building will be of the same dimensions as the foundry and will be used as a storage and warehouse, with rooms for packing, finishing, etc. Ground will be broken by Sept. 1. The foundry is to be ready for business early next Spring, and by the 1st of next July the whole plant is to be going. In building this works the Westinghouse Co. intends to concentrate its electrical manufacturing in one big plant. The works on Lacock street, Allegheny, those on Garrison alley, Pittsburg, and the big plant at Newark, N. J., will be abandoned.

General Industrial Notes:—

Sharon Furnace, of Hall & Co., at Sharon, Pa., has been banked down temporarily.

Estimated net earnings of the Tennessee Coal & Iron for June were $81,200; fixed charges $60,300; surplus $20,900.

On account of the breaking of the hoist engine, the Buffalo Furnace Co., of Buffalo, N. Y., were obliged to blow out their furnace on July 1.

The contract for the erection of a 34″ blooming mill for the Ohio Steel Co., at Youngstown, O., has been given Julian Kennedy, the Pittsburg engineer.

The plant of the Valley Foundry & Machine Works, at Montgomery, Ala., recently destroyed by fire, will be rebuilt at once, and the former capacity be increased.

There is not a charcoal pig iron furnace in the Upper Peninsula of Michigan in blast at present. The Weston furnace at Manistique has blown out for the first time.

At Pittsburg, suit has been brought by the Sigua Iron Co., owners of iron ore mines in Cuba, against F. F. Vandevort to recover $3,000 on unpaid stock subscription.

The Bay View mills of the Illinois Steel Co., which started up recently, are closed again. About half the plant is idle. Manager Hilton says this state of affairs is due to the dull state of trade.

The repairs at the Rosena furnace, at New Castle, Pa., are so complete that only the shell of the old furnace will be used. It will go into blast in October and will then have a capacity of 225 tons a day.

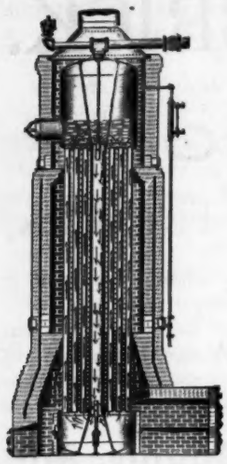
The Bethlehem Iron Co. has just shipped 40 tons of barbette for the Indiana, at Cramp's, 104 tons of shutter plate for the battleship Texas, and 200,000 pounds of ordnance for the army gun factory at Watervliet.

The foundry and machine shop business formerly carried on by Mrs. J. H. Smith, at Athens, Tenn., has been sold to C. T. Riddle and Jacob Collins, who will continue the business in the firm name of C. T. Riddle & Co.

Thirteen locomotives for the Wilkesbarre & Eastern have been turned out by Rogers Locomotive Works. The New York & New England has awarded a contract to the Baldwin Locomotive Works for building ten freight engines.

The Peerless Foundry Co., of Alter street, Philadelphia, composed of seven practical molders of large experience, commenced business a few months since. The company have a reputation among the trade on account of their ability to turn out castings requiring intricate core work.

More than 400 men are now at work upon the plant of the Ohio Steel Co., at Youngstown, O. Work in the machine



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shop will begin shortly. The iron work on the cupola houses is now in progress and will soon be finished. The foundations of the gas producers are under way and preparations are being made to put in more tracks.

At Cleveland, the Cuyahoga county commissioners opened bids on the superstructure of the new Brooklyn-Brighton bridge. Nine bids were received, ranging from $153,000 bid by the Forest City Iron & Wire Co. to $134,990 bid by the King Bridge Co. and the Champion Bridge Co. The contract was awarded the King Bridge Co.

The Andrews Bros.' Co., of Youngstown, O., proprietors of the Haselton Iron Works, Haselton, O., are putting in three new Adams porcupine boilers in the finishing department of their Hazelton mills. Two new roll lathes are also being added. The entire plant is now closed, undergoing repairs amounting to $18,000 or $20,000.

A third furnace of the Maryland Steel Co., at Sparrow's Point, Md., was banked last week, throwing all the furnaces which had been in operation out of blast. About 300 laborers are out of employment from the shut down. The Bessemer steel mill will be run three days in the week, and will use the supply of pig iron which has accumulated at the works.

The earnings of the higher priced men at the Homestead works under the recent introduction of electrical and other appliances are indicated by the statement in the Pittsburg *Times*, that heaters on the 33-inch and 40-inch are paid $140 a month for a turn of eight hours, and those on the 23-inch mill $125 for the same turn. The heaters on the armor plate mills are paid, it is said, 18 cents a ton.

Electricity is being employed in the Homestead mills in various new directions, as already noted in these columns. Lately two additional tables, operated by electricity, have been added to the 23-inch mill, and now the operations of roughing and finishing are pursued simultaneously on the same train. Electricity is to be also used for screwing down on the 40-inch mill, and is to supersede steam power in many ways.

The board of public works, of Milwaukee, opened bids for the superstructure of the Holton street viaduct last week. The Wisconsin Iron & Bridge Works made the lowest bid—$19,149 on the draw and side spans, and $39,800 on the viaduct—but the board will award the contract to the firm offering the most acceptable plan. The King Bridge Co. bid $52,600 on the viaduct; the Youngstown Bridge Co., $58,500; the Detroit Bridge & Iron Works, $52,218.

The Penberthy Injector Co., of Detroit, Mich., report that in spite of the depression, their business is steadily increasing. Since completing the additions to their factory, they have added eight new speed and monitor lathes to their plant, also a new Reed engine lathe and a Universal milling machine to their tool room outfit. The capacity of their works is now 2,000 machines a month, and they are yet unable to accumulate any stock, but are frequently behind their orders.

The New Castle, Pa., Sheet Mill has been completed, and during the first week in August the fires will be lighted and the machinery tested. The new mill, when running in full, which it is expected to do from the first, will give employment to at least 300 hands. The greater part of the hands will be Welshmen, many of whom have already arrived in New Castle. It is said to be the most complete mill in the United States, and during its test tin manufacturers from all over the country will be present, as some of the improvements in the machinery will be used for the first time in any country.

Immediately following the decision of Secretary of the Navy H. R. Herbert, in favor of all Harveyised plates for naval construction, the Carnegie Steel Co. began arranging for the erection of 40 Harvey furnaces in addition to the 18 now in use. These furnaces will be built to accommodate the various shapes given the side armor after the shapes have been fitted and molded in the press shop, and will enable the firm to turn out the material with great rapidity. Preparations are also advancing for the erection of an additional armor plate mill, of a size that will handle the very largest plates with ease. It is stated that part of the requisite machinery will be purchased at Whitworth's works in England, and that General Manager

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C. M. Schwab's visit to England is for the purpose of attending to this matter.

The Sebastian-May Co., of Sidney, O., is now under the sole control of A. P. Wagner, who was associated with Messrs. Sebastian and May in the early portion of their stay in Sidney. New and improved machinery has been added recently, including a 75-light dynamo run by a special engine, which is now being set up. This is to permit of night work, so that the shop may overtake orders which have accumulated recently. A number of skilled machinists have recently been brought from Cincinnati and the mechanical supervision is in the hands of C. H. Maltby, a new superintendent, formerly of Dayton, and J. Rahn, Jr., his assistant, formerly of Cincinnati. A new pattern room is being equipped, and it is the company's intention to bring out a new lathe in the Fall. The name of the company will be changed to the A. P. Wagner Machine Tool Co. The list of orders now on file with the company calls for shipments to every part of the world.

To the Mountain and Ocean Resorts via Pennsylvania Lines.

The advantages peculiar to the Pennsylvania Lines make them the desirable thoroughfares to Bedford Springs, Altoona, Ebensburg, or any of the delightful summer havens in the cool Allegheny Mountains. By no other route can Cresson, the ideal retreat on the crest of that romantic mountain range be reached, as the Pennsylvania is the only line direct to it, and the only one leading past the Pack Saddle and the Allegrippus, around the famous Horse Shoe Curve and along the Blue Juniata, the richest of America's scenic gems. For reaching Atlantic City, Cape May, Ocean Grove, Asbury Park, Long Branch, Sea Girt, Elberon, Ocean Beach, Berkeley, Newport, Narragansett Pier, Martha's Vineyard, Nantucket or any of the numerous watering places that dot the Atlantic seaboard from the Carolinas to Maine, these lines are particularly desirable. For a trip to the Adirondacks, the Catskills and resorts in Northeastern New York, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire and Maine, exceptional facilities for a delightful journey are offered passengers via this direct route. For detailed information, please apply to your nearest Pennsylvania Line ticket agent, or address F. Van Dusen, Chief Assistant General Passenger Agent, Pittsburg, Pa.

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other points ask any agent on the C. H. & D. system, or address E. O. McCormick, G. P. & T. A., C. H. & D.R. R., Cincinnati, O.

Knights of Pythias Excursion to the World's Fair.

The C. H. & D. R. R. Co. will send out a special train for this excursion to Chicago, on Aug. 5th, at 9 P. M. Tickets for the round trip good for 10 days. Full particulars can be obtained by addressing E. O. M'Cormick, Genl. P. & T. A., C. H. & D. R. R., Cincinnati, O.

LAST week closed with positive evidences of improvement in the monetary situation. The New York bank statement is the most notable of these indications. A statement which shows a gain of $2,000,000 in actual cash, while loans and discounts are cut down about $4,000,000 and the reserve is increased $3,000,000, indicates a gain in strength that is a strong sign of the turning of the tide. Concurrently with this are indications of better feeling everywhere. Out in Denver the people have regained their senses and are depositing their money, as is usually the case after a panic has run itself out. At Pittsburg, where there has been no worse development of the trouble than tight money and depressed securities, there signs of relaxation in the money market; while a more positive improvement is shown in the quotations for local securities. The tractions and other active securities have made a comfortable advance from the extreme point of depression, while the solid and less active bank shares have hardly been shaken in their prices. Against these encouraging signs is to be set the development of a weak spot at Milwaukee, where a couple of banks closed yesterday.—[Pittsburg Dispatch.

THE Lodge & Davis Machine Tool Co., of Cincinnati, have received an order for an outfit of machine tools, lathes, shapers, drill presses, and other tools, from the Robinson Glass Co., of Zanesville, O., a new company. It is gratifying to the Lodge & Davis Co. that with the more that usual quietness of the summer time, inquiries are coming in sufficient to keep business moving.

CARNEGIE rod and wire mills at Beaver Falls, Pa., have shut down for two or three weeks.

THE capacity of the iron furnaces in blast, as shown by their July statements, is now about 10 per cent. less than in June, a result which had been generally expected from the condition of the iron market. A still further reduction is not improbable, as we hear from time to time of different furnaces going out of blast, generally those which for some reason or other are unfavorably situated. In this industry, as in nearly all others, there seems to be a general tendency to reduce wages, though those paid here in the East are already so low as to be scarcely actual living expenses for the men.—[Engineering and Mining journal.

LOCATION FOR FACTORIES.

Chicago, Milwaukee & St. Paul Railway Co.,

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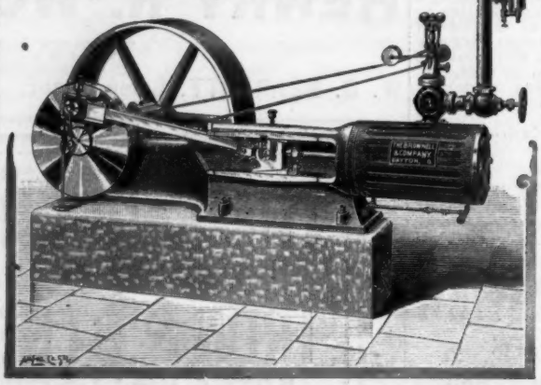

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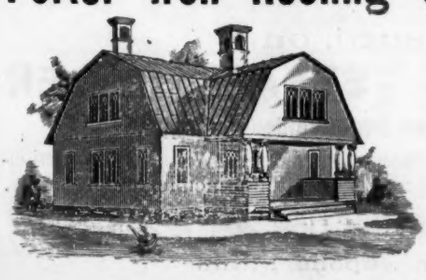

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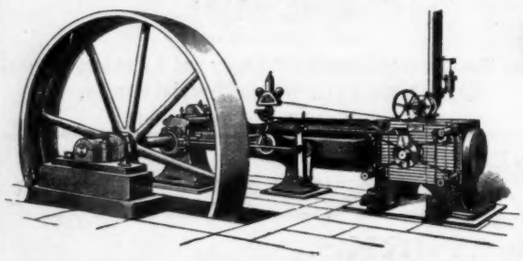

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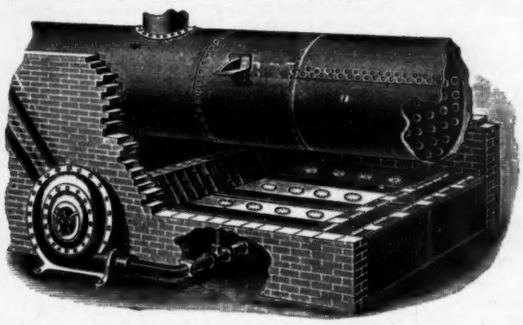

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The S. Obermayer Co., Cincinnati, O.
James M. Carter & Co., Cleveland, O.
The J. S. McCormick Co., Pittsburg, Pa.

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James Jenks, Detroit, Mich.

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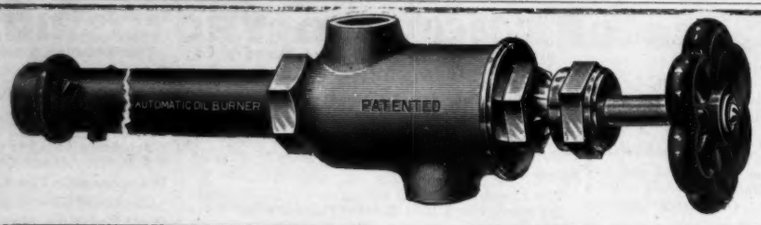

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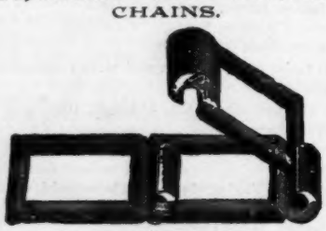

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Bessemer	$13 20@$13 40
No. 1 Strong Foundry	13 75@ 14 00
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No. 1 Grey Forge, red short	11 75@ 12 00
No. 2 Gray Forge, neutral	11 50@ 11 75
No. 1 American Scotch	14 00@ 00 00
No. 2 American Scotch	13 00@ 00 00
Lake Superior Charcoal	16 00

PITTSBURGH (reported by A. H. Childs):

No. 1 Foundry	$13 50@$13 75
No. 2 Foundry	12 50@ 12 75
Grey Forge	11 75@ 12 25
White and Mottled	11 50@ 11 60
Warm Blast Charcoal	18 00@ 21 00
Cold Blast Charcoal	23 00@ 27 00
Bessemer	13 20@ 13 40

CHICAGO (reported by our representative:)

Lake Superior Charcoal	$16 25@$16 75
Local Coke Foundry No. 1	13 75@ 14 25
Local Coke Foundry No. 2	13 00@ 13 25
Local Coke Foundry No. 3	12 75@ 13 00
Local Scotch Foundry No. 1	14 00@ 15 00
Local Scotch Foundry No. 2	13 50@ 14 00
Local Scotch Foundry No. 3	13 00@ 13 50
Southern Coke No. 1	14 10@ 14 35
Southern Coke No. 2	12 60@ 12 85
Southern Coke No. 3	12 10@ 12 35
Southern No. 1 Soft	12 60@ 12 85
Southern No. 2 Soft	12 10@ 12 60
Southern Silveries No. 1	14 50
Southern Silveries No. 2	14 00
Ohio Silveries No. 1	16 50@ 17 00
Ohio Silveries No. 2	16 25@ 16 75
Ohio Strong Softeners No. 1	16 50@ 17 00
Ohio Strong Softeners No. 2	15 50@ 16 00
Tennessee Charcoal	16 00@ 16 50
Alabama Car Wheel	00 00@ 18 85

CINCINNATI (reported by Rogers, Brown & Co.):

Southern Coke No. 1, Foundry	$12 75@$13 25
Southern Coke No. 2 and No. 1 Soft	11 50@ 12 00
Hanging Rock Coke, No 1	15 00@ 15 50
Hanging Rock Charcoal No. 1, Fdy	18 50@ 19 50
Tennessee Charcoal No 1	15 50@ 16 00
Jackson County Stone Coal No 1	15 50@ 16 00
Southern Coke, Grey Forge	10 50@ 11 00
" Mottled	10 25@ 10 50
Standard Alabama Car Wheel	18 00@ 19 00
Tennessee " "	17 00@ 17 50
Lake Superior " "	17 50@ 18 00

BUFFALO (reported by Rogers, Brown & Co.)

Mahoning and Shenango Valley, strong, No. 1 Foundry	$14 00
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Ohio Softener No. 1	14 00
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Jackson Co. Silvery, No. 1	$17 00@ 17 30
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Lake Superior Charcoal	16 00
Tennessee Charcoal	16 00
Southern Softener No. 1	13 65
Alabama Car Wheel	18 00
Hanging Rock Charcoal	20 50

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Southern Coke No. 2	12 00@ 12 00
Southern Coke No. 3	11 25@ 11 50
Southern Charcoal No. 1	15 50@ 16 00
Southern Charcoal No. 2	15 00@ 15 50
Missouri Charcoal No. 1	17 00@ 17 50
Missouri Charcoal No. 2	16 50@ 17 00
Neutral Coke	10 75@ 11 00
Mottled	10 50@ 10 75
Southern (standard brands)	17 50@ 18 50
Southern (other brands)	16 50@ 17 00
Lake Superior	18 00@ 18 50

DETROIT (reported by F. B. Stevens, 74 Griswold St.):

Southern Coke No. 1 Foundry	$14 10@$14 35
Southern Coke No. 2 Foundry	12 85@ 13 10
Southern Coke No. 3 Foundry	12 10@ 12 35
Southern Coke No. 1 Foundry soft	12 85@ 13 10
Southern Coke No. 2 Foundry soft	12 10@ 12 35
Southern Grey Forge	11 85@ 12 10
Bessemer	15 00@ 15 25
Lake Superior Charcoal No. 1	17 00
Lake Superior Charcoal No. 2	16 00

LOUISVILLE (reported by Geo. H. Hull & Co.)

Southern Coke No. 1 Foundry	$12 75@$13 25
Southern Coke No. 2 Foundry	11 50@ 12 00
Southern Coke No. 3 Foundry	11 00@ 11 25
Grey Forge	10 50@ 10 75
Spathite	11 50@ 12 50
Southern Charcoal No. 1 Foundry	15 00@ 16 00
Car Wheel	17 50@ 17 75

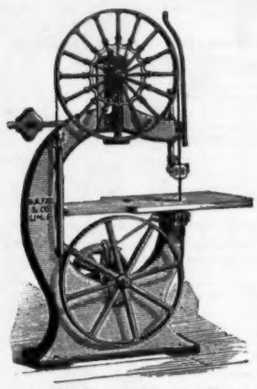
SUPERIOR MACHINE COMPANY,

106 CANAL ST., CLEVELAND, O.

MANUFACTURERS OF

Automatic Gear Cutters,
Duplex Milling Machines,
Motor Gears.

JOBBING and GEAR CUTTING of all kinds done with accuracy and dispatch.



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J. A. FAY & EGAN CO.,

251 to 271 W. Front St., CINCINNATI, OHIO.

OWNERS AND OPERATORS OF

J. A. FAY & CO. THE EGAN CO.

1835 ESTABLISHED 1873

Originators and Constructors of

WOOD-WORKING MACHINERY.

MEDALS FOR SUPERIORITY OVER ALL COMPETITORS.

350 awarded us by the various expositions in this country and abroad.

"GRAND PRIX" by the Universal Exposition, Paris, 1889.

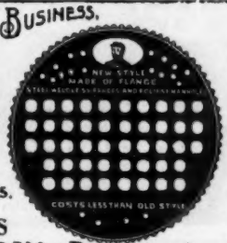
Decoration of the "Legion of Honor" conferred by the French Government.

HAND PLANERS—20 SIZES AND KINDS.

BEING IN THE BOILER BUSINESS.

MAKING STATIONARY TUBULAR BOILERS EXCLUSIVELY.

WE CAN MAKE A BETTER BOILER AND ALTHOUGH WE MAKE THEM OF FLANGE STEEL WITH WELDLESS BRACES AND ECLIPSE MANHOLES SELL THEM FOR LESS MONEY THAN OLD STYLE ONES.



WE FURNISH NEATER LITHOGRAPHS AND DETAIL ILLUSTRATIONS OF THIS CLASS OF BOILER THAN ANY FIRM IN THE UNITED STATES

FULTON STEAM BOILER WORKS AND FOUNDRY, RICHMOND, IND.

THE STURTEVANT

BLOWERS AND EXHAUSTING FANS.

(Known as the Monogram Pattern.) (4)

For Blowing Boiler Fires and Exhausting Dust.

The Sturtevant System of Heating and Ventilating

MANUFACTURING ESTABLISHMENTS.

PORTABLE FORGES.

B. F. STURTEVANT CO., Boston, Mass.

BRANCHES:

91 Liberty St., NEW YORK. 16 S. Canal St., CHICAGO. 15 N. Third St., PHILADELPHIA.

St. Louis (reported by Rogers, Brown & Meacham):

Southern Coke No 1	$13 25@$13 75
Southern Coke No. 2	12 00@ 12 50
Southern Coke No. 3	11 50@ 11 75
Southern Grey Forge	11 25@ 11 50
Southern Charcoal No. 1	15 50@ 16 00
Missouri Charcoal No. 1	14 00@ 14 50
Ohio Softeners	16 50@ 17 00
Lake Superior	17 50@ 18 00
Southern	18 25@ 18 50
Connellsville Coke, St. Louis	5 65

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

	Gross Tons
Old iron rails	$18 50
Old steel rails	13 50
	Net Tons
No. 1 R. R. wrought scrap	$13 00
No. 1 wrought scrap	12 00
No. 1 Machine cast scrap	10 75
Iron axles	19 00
Axle turnings	11 00
Wrought turnings (free from cast)	9 00
Cast borings	6 75
Uncut wrought iron boilers	7 00
Steel boiler Plates	10 00
Grate bars	5 00
Pipes and flues (clean)	9 00
Tank iron	9 50
Hoop and band iron	7 00
Sheet iron	7 00
Wrought drillings	7 00
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. mill)	1.65c@1.75c
Angles	1.55c@1.65c
Tees	1.90c@2.00c
Universal Plates	1.65c
Sheared Plates	1.75c

MERCHANT IRON AND STEEL.

Flat Bar.	
1½ to 4 by ⅜ to 1 inch	1 65
4¼ to 6 by ⅜ to 1 inch	1 70
1¾ to 6 by 1¼ to 2 inch	1 85
1¼ & 1¾ by ⅜ to ¾ inch	1 70
1 & 1⅛ by ⅜ to ¾ inch	1 75
⅛, ¼, ⅜, by ⅜ to ¾ inch	1 85
Round and Square.	
1 to 1⅜ inch	1 65
2 to 2⅝ inch	1 75
2¾ to 3¼ inch	1 90
3⅜ to 4 inch	2 15
4¼ to 4½ inch	2 75
4¾ to 5 inch	3 00
Oval.	
⅞ to 1¼ inch	1 85
⅝ to ¾ inch	1 85
½	2 05
⅜	2 25
Half Oval and Half Round.	
1½ to 3 inch	2 20
⅞ to 1½ inch	2 00
⅝ to ¾ inch	2 25
½	2 40
⅜	3 50
Heavy Band.	
1¾ to 6 by ¼ and 5-16 inch	1 75
1 to 1¾ by ¼ and 5-16 inch	1 80
¾ to ⅞ by ¼ and 5-16 inch	1 90
½ to ⅝ by ¼ and 5-16 inch	2 15
Hoops.	
1¾ to 4, Nos. 13 to 15	2 40
1¾ to 2, Nos. 16 to 18	2 45
1¾ to 2. No. 19	2 50
1¾ to 2, No. 20	2 50
1¾ to 2, No. 21	2 60
1¾ to 2, No. 22	2 70
15-16, 1 and 1⅛, Nos. 13 to 15	2 45
15-16, 1 and 1⅛, Nos. 16 to 18	2 50
15-16, 1 and 1⅛, Nos, 19 and 20	2 60
15-16, 1 and 1⅛, No, 21	2 70
15-16, 1 and 1⅛, No. 22	2 80
⅞, Nos. 13 to 15	2 60
⅞, Nos. 16 to 18	2 70
⅞, Nos. 19 and 20	2 80
⅞, No. 21	2 90
⅞, No. 22	3 00
13-16, Nos. 13 to 15	2 70
13-16, Nos. 16 to 18	2 80
13-16, Nos. 19 and 20	2 90
13-16 No. 21	3 00
13-16, No. 22	3 10
¾, Nos, 13 to 15	2 80
¾, Nos. 16 to 18	2 95
¾, Nos. 19 and 20	3 00
¾, No. 21	3 10
¾, No. 22	3 25
11-16, Nos. 13 to 15	3 05
11-16, Nos 16 to 18	3 10
11-16, Nos. 19 and 22	3 20
11-16, No. 21	3 30
11-16, No. 22	3 40
⅝, Nos. 13 to 15	3 10
⅝, Nos. 16 to 18	3 20
⅝, Nos. 19 and 20	3 30
⅝, No. 21	3 40
⅝, No. 22	3 50
⅝, No. 23	3 60
Light Band.	
1½ to 6 by ⅛ to 3-16 inch	1 95
1⅛ to 6 by Nos. 11 and 12	2 00

Brainard Milling Machine Co.

EXHIBIT AT

- Machinery Hall, World's Fair, -

COLUMN K 39.

Plain and Universal Milling Machines,

Automatic Gear Cutting Machines,

Special Cam Cutting Machines.

These machines can be seen in operation.

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Of all Descriptions, also

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Lanterns, Etc.

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SPICER SHEET METAL TRUCK.

Platform, 90″ long, 27¾″ wide; made of best seasoned hickory, with slat top. Weight, 350 pounds. For particulars address

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New Philadelphia, O.

Capacity, 2½ tons.

Especially adapted for Tin Plate, Sheet Lead, Sheet Iron and Steel.

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Stump before a blast. | Fragments after a blast.

STRONGEST and SAFEST EXPLOSIVE

Known to the Arts.

POWDER, FUSE, CAPS,

Electric Mining Goods,

AND ALL TOOLS FOR STUMP BLASTING,

FOR SALE BY THE

HERCULES POWDER COMPANY,

40 Prospect Street, Cleveland, Ohio,

J. W. WILLARD, Manager.

HERCULES,
THE GREAT STUMP AND ROCK
ANNIHILATOR.

1 to 1¾ by ½ to 3-16 inch	2 00
1 to 1¾ by Nos. 11 and 12	2 05
⅞ and 13-16 by ½ to 3-16 inch	2 15
⅞ and 13-16 by Nos. 11 and 12	2 20
¾ and 11-16 by ½ to 3-16 inch	2 25
¾ and 11-16 by Nos. 11 and 12	2 30
⅝ and 9-16 by ½ to 3-16 inch	2 40
⅝ and 9-16 by Nos. 11 and 12	2 45
½ by ⅜ to 3-16 inch	2 55
½ by Nos. 11 and 12	2 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 20
⅞ inch, " " " 13 and 14	2 30
¾ inch, " " " " 11 and 12	2 35
¾ inch, " " " " 13 and 14	2 55

Sheet Iron.

No. 10 to 14	2 30
No. 15 to 17	2 45
No. 18 to 21	2 60
No. 22 to 24	2 70
No. 25 to 26	2 80
No. 27	2 90
No. 28	3 55

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 25
C No. 1, " "	2 40
C H No. 1, " "	2 50
C H Flange, " "	3 50
Extra Flange "	4 00
Solid Fire Box "	4 75

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 25
Shell	2 50
Flange	2 75
Marine Flange	3 00
Fire Box	4 00
Above includes plates 90 inches wide.	
90 to 96 in. wide	½c. ℔. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	specia

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s.
1 to 2 in, inclusive	08
9-16 to ⅞ in. "	08½
7-16 to 3/8 and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅝ to 11-16 and 4½	10
⅛ to 6 in	10½
¼ to 9-32 and 6⅛ to 7 in	11
3-16 in	13

Flats.

	cts. ℔s.
2 to 9-16 in. wide by 2 to 5/8 thick	8

Bessemer and O. H. Steel.

Machinery	base price, 2 35
Tire	" 2 25
Spring	" 2 80
Sleigh Shoe	" 2 50
Toe Calk	" 2 35
Cutter Shoes, tapered and bent	" 2 75

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

MACHINERY SUPPLY MARKET.

Anvils.

American	℔ 9@10
Wright's	℔ 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 45
Munson's Short Lap Double and Light Double Leather	dis 50
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis 45

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 30
Horton's Universal	dis 40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

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Run Lightest, Make Strongest Blast & Last Longest.
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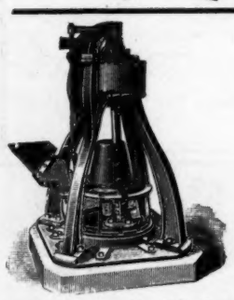
THE FOOS MFG. CO. SPRINGFIELD, OHIO.



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CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE
Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F. F. FF.
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 55@60
Norton's	dis 55@60
Grant	dis 55@60
Sterling	dis 60
Celluloid	dis 10&33½
Northampton	dis 55
Crystal	dis 65@70
Vitrified	dis 60
Vulcanite	dis 60&10
Hamden	dis 60&10
Cyclone	dis 60

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 25
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 50
Industry File Works, Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	15c
" " " " over 5 lbs	12c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¾	3⅛
Hexagon	15⅛	11½	8½	6	5¾	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887	dis 75
Standard Penny Nails, ₩ keg card rate	
{ Car lots	$1.55
{ Less than car lots	$1.60

Oilers.

Zinc and Tin	dis 60
Brass and Copper	dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz	dis 10@10&10

Packing, Steam.

Boston Belting Co.	dis 60
American Packing Hemp	₩ lb 9@10
Russia " "	₩ lb 14
Italian " "	₩ lb 13@19
Plumbago Piston	₩ lb 40
Peerless	₩ lb 60
Morrison's "	₩ lb 50
Square Flax "	₩ lb 50
Sheet Rubber	₩ lb 12&24
Excelsior Rubber	₩ lb 48
Rainbow { Full Rolls	45c ₩ lb
Rainbow { Less than Full Rolls	50c ₩ lb
Eclipse Gasket	₩ lb 75

Picks.

Railroads, 5 to 6 lbs	$12 dis 60
" 6 to 7 lbs	$13 dis 60

Pulleys.

Iron Pulleys, Walker List	dis 40
Medart Pulleys	dis 50
Split Wood Pulleys	dis 50@55

Rivets.

Iron, Thousand, list November 17	dis 50&10@60
Iron, Ordinary, Cooper's Block and Carriage list November 17	dis 50&10@60
Copper	dis 50@50&10

Saws.

Disston's Circular	dis 40&10
" Band	dis 25
" Scroll	Net
Hack Saw Stubs	dis 20
" " Eureka	dis 20
" " Star	dis 20
Saw Swages Diston's	dis 30
Atkins' Circular Saws	dis 40&45
" Mill, Mulay and Drag Saws	dis 40&10
" Wood Saws	dis 40&10
" Silver Steel Diamond Cross-cut Saws	70c per ft
" Dexter Cross-cuts	50c "
" Diamond "	30c "
" Tuttle Tooth Cross-cuts	25c "
" One-man Cross-cuts	33c "

No. 1 Handles	23c per pair
No. 6 "	16c "
Excelsior Saw Tools	$6 per doz
Perfection "	$15 "
Detroit Saw Works, Circular	dis 50
" " " Band	dis 25
" " " Mulay	dis 45

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

New List, Jan. 18, 1884

Brass	dis 30
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ℔ lb dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

Bolt and Nut Works.

THE UPSON NUT CO., Manufacturers of Nuts, Washers, Carriage, Machine, Plow and Elevator Bolts, Coach Screws, etc.

Steel Stamps and Stencils.

FLEHARTY, J. H. & Co., Rubber Stampes Seals, Stencils, Automatic Check Punchs, and Numbering Machines. 92 Seneca St.

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Mining, Mineral and Timber Lands.

Municipal Bonds, Farm and City Mortgages, Short Time Paper. Large Tracts of Florida Phosphates and Hammock Lands. Investment Securities of all kinds bought and sold on commission.

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OLD FILES RE-CUT.

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Steel Name Stamps 1-16, 3-32 or ¼ inch letters, 15c per letter.

STEEL, IRON, COPPER, ZINC, BRASS, TIN,

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GRAIN CLEANING AND MINING MACHINERY,
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COFFEE MACHINERY, ETC., ETC.

STANDARD SIZES PERFORATED TIN AND BRASS ALWAYS IN STOCK.

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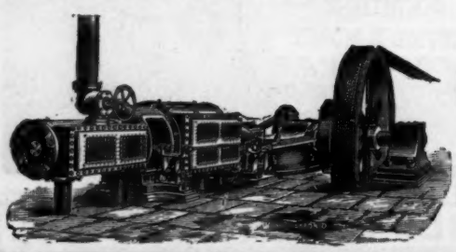
THE PORTER-HAMILTON ENGINE

SINGLE, COMPOUND & CONDENSING



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Heavy Special Machinery.

ENGINE CATALOGUE ON APPLICATION.

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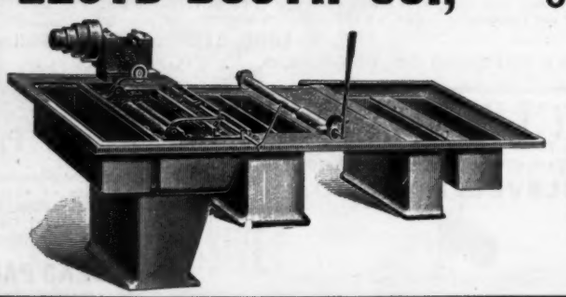

Rolling Mills, Sand and Chill ROLLS.

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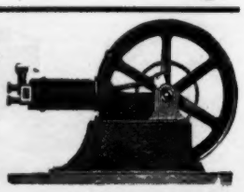

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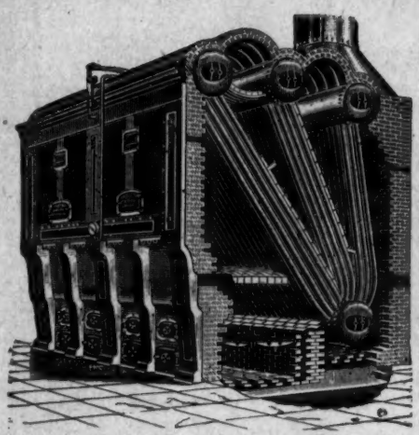

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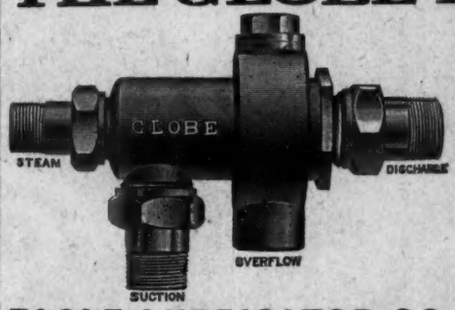

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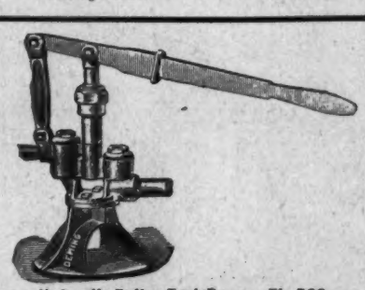

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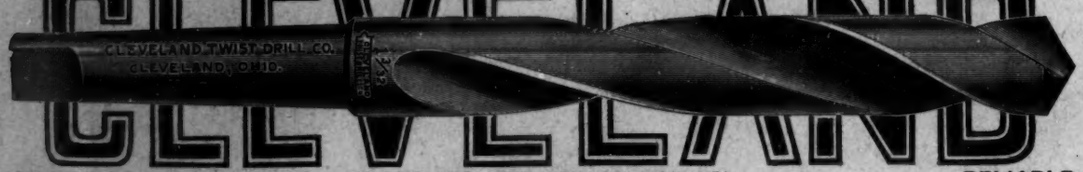

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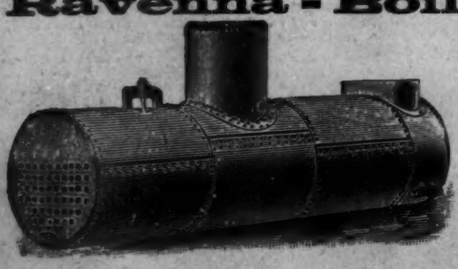

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